The Sight-Saving Review

Volume IX Number 4

December, 1939

Table of Contents

PAGE

ADVANCES IN PREVENTION OF BLINDNESS AND CONSERVATION OF SIGHT—A Summary of Conference Features, Ira V. Hiscock, Sc.D. 251

A SURVEY OF ILLUMINATION IN SELECTED COLLEGE BUILDINGS, Louis M. Hickernell, M.D. 259

TRACHOMA CONTROL IN THE INDIAN SERVICE, J. G. Townsend, M.D. 280

THE RÔLE OF HEALTH DEPARTMENTS IN THE PREVENTION OF BLINDNESS, John L. Rice, M.D. 290

THE READABILITY OF STENCIL-DUPLICATED MATERIALS, Matthew Luckiesh and Frank K. Moss 295

THE FORUM:

Treating Trachoma by Trailer, Ann West 305

NEWS OF STATE ACTIVITIES 309

NOTE AND COMMENT:

Eye Health Institute 321
National Social Hygiene Day 321
Contact Lenses Make Their Début in the "Movies" 322
Courses in Ophthalmology at George Washington University School of Medicine 322
The Eyes as a Gauge of General Nutrition 322
Sweets for the Eyes of High Flyers 323

CURRENT PUBLICATIONS ON SIGHT CONSERVATION 324

CONTRIBUTORS TO THIS ISSUE 325

PAGE

INDEX—SIGHT-SAVING REVIEW, Volume IX: 1939 326

SUPPLEMENT: Sight Conservation Through Fuller Understanding of the Patient, Lena R. Waters, Chairman 3

1. The Young Child with a Visual Handicap, Helen H. Shaw 4
2. The Older Child with Eye Difficulties, Bertha Ross .. 12
3. Children with Temporary Eye Difficulties, Ruth E. Lewis 21

Advances in Prevention of Blindness and Conservation of Sight—A Summary of Conference Features*

Ira V. Hiscock, Sc.D.

A RUNNING account of the various sessions of the Society's Annual Conference.

AN EDITORIAL in the New York *Times* this morning emphasized the significance of this work for the prevention of blindness, the last two sentences concluding as follows: "Eyes were made for seeing. That is this Society's reason for being." How the vision of leaders protects sight through the practical co-operative application of cumulative scientific knowledge has been evident in the discussions of the Conference. The vision and leadership displayed through the years have come from many sources but I am impressed with the position of the National Society as a voluntary agency co-operating with official national, state, and local bodies as a guide along the pathway which has been cleared over the last 25 years.

Following the early emphasis on ophthalmia neonatorum, we see a gradual evolutionary process to include not alone the prevention of blindness but the protection of eyesight. In this growth we find an inspiration, revealed in the study of the annual reports and the previous conference programs, and in the expressions which have come from such leaders in this organization as Mr. Glenn, Dr. Park Lewis, Mr. Morgan, Mr. Carris, and the present active staff. We see a stimulating body for sound legislation. We find a service headquarters co-operating in the development of procedures, collaborating with many workers, assisting in education and training,

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, New York, October 28, 1939.

and demonstrating opportunities. Here is an educational and interpreting center, with a carefully conceived and ably executed voluntary program stimulating investigation, counseling governmental and voluntary agencies, and serving as a clearinghouse.

Considerable emphasis has been given to nutrition as one of the several important factors relating to the eye. This embraces the protective foods and an understanding of diets in relation to various factors of eye difficulties. Here again we see nutrition becoming increasingly recognized as an important part of public health.

Among other special problems is trachoma. There are some 60,000 cases distributed over the United States in endemic form among native Americans, the foreign born immigrants, certain Asiatic and Mexican groups, the American Indians and even sporadically among city dwellers. The Indian problem is a little different from the rest, varying with the different reservations enormously, of course, from zero among the Seminoles to some 35 per cent among the Navajos. I was struck by the changes which seem to have occurred between the studies being made in some of these areas and previous studies, as well as by the variation by states. Of some 25,000 cases among the Indians, the largest actual numbers are reported in Arizona and New Mexico, with relatively large percentages also in Montana and Wyoming. Among the non-Indian peoples, a group we have not thought so much about, 35,000 cases exist, some 70 per cent being found along the old trail of the early settlers from the Atlantic Seaboard to the junction of the Ohio and the Mississippi Rivers.

When the first trachoma census was made by the U. S. Public Health Service 27 years ago, an infectivity rate of some 69 per cent was reported in Oklahoma. But the percentage for that state is listed as one of the smallest now, although over a third of the cases of blindness in this group are traced to trachoma. Hence a large problem still remains. There is some comfort in the progress reported in treatment from the use of sulfanilamide.

More recognition is properly being given in the industrial field to protecting the eyes of the industrial workers, to industrial eye injuries, to the problem of poisonous substances, to the work of the Federal Government in conserving the sight of the industrial worker not only through assistance in development of codes, but

to those in federal employ including the W.P.A. and C.C.C. groups. We are impressed by the cost of these hazards in the industrial field, but in mentioning cost we need to bear in mind, as the speakers have emphasized, the fact that this cost in dollars and cents is a small part of the whole story. We often find many factors which are a good deal more important than the condition which appeared on the surface. We need to see the whole family picture in relation to the employment status and the community problem.

Because of the intervention of the European war, the medical representative of the Industrial Eye Injuries Committee, Royal Eye Hospital, Mr. Joseph Minton, F.R.C.S., was unable to present in person his discussion on "What Treatment of 7,000 Industrial Eye Injuries Has Taught Us." A brief review of his prepared paper brought out the facts that the high incidence of eye injuries is due to the lack of provision of safety measures by many employers, and the negligence by many workmen in using safety measures when provided. The problem must be tackled by making employers conscious of the necessity for providing safety measures, and by educating workmen and encouraging them to overcome their prejudice against wearing goggles and other protective appliances.

Another speaker referred to increased interest in the work in poisonous gases and chemicals in industry. The New York State Division of Industrial Hygiene, after study, approved last year approximately 2,000 sets of engineering plans for the control of such toxic materials in the New York factories. These poisonous substances are more numerous than some have thought, embracing carbon tetrachloride, carbon monoxide, carbon disulfide, hydrogen sulfide, lead, and many others. That mandatory provision should be made for use of protective devices was proposed, as has been done to protect from other industrial hazards.

In regard to the cost, it is interesting to find that about 8,000 are blind because of eye hazards, and that over 80,000 have lost the sight of one eye. Each year some 75 persons lose the sight of both eyes, with 2,000 losing the sight of one eye. These are large figures, but they do not include the whole story because not so much is said about the thousands who partially lose sight. One of the national organizations feels that perhaps this is a 50 per cent understatement. The National Society for the Prevention of Blindness

once estimated the net cost of the industrial eye injuries at some $50,000,000. They now believe that $100,000,000 would probably come nearer the actual experience. One speaker asserted that 98 per cent of these are needless; they could be prevented if certain provisions were taken. Among the provisions which are needed is the realization by management of prevention factors. That is coming but more slowly than a good many would like to see.

In the second place, there is needed courage and desire to issue administrative orders and follow through to be sure that the plant is physically safe, that there is more education of the workers and supervisors and that there is better co-operation between the workers in the protection and the management of the protection of the worker. Those of us who have visited factories know something about what that problem entails.

Turning to federal participation in some of these industrial factors, it is encouraging to find: (a) development of such groups, for instance, as the committee on adequate lighting in the interdepartmental committee; (b) improvements in illumination conditions; and (c) carefully planned programs for education and promotion of the lines of activity which are known to be worth while. More than half a million pairs of protective goggles have been purchased by the government for the W.P.A. employees over a period of four years, and many thousands for the other groups engaged in those activities where there is a real hazard. The Bureau of Mines has also for some time been giving attention to this problem, while the United States Navy has studied some of these safety factors leading to proposed codes in some instances, and to proposed programs in others.

In the work for preschool children, we find emphasis being given to the importance of knowledge regarding the development of the eye itself and of early supervision of eye muscle control. The key position of the pediatrician in saving sight is one which involves a challenge to those engaged in medical education as well as to organized state and local medical societies, health departments, and other agencies which may serve as channels for increasing insight in regard to the way the general examinations are conducted, the pediatric treatment and what it embraces, the relationships with specialists which have been emphasized so much. Gradually more

people in the field of pediatrics are taking hold of this opportunity.

But with it all, unless we are carrying along a certain amount of education of the parents to be conscious of some of the problems which they might recognize and upon which they should seek assistance, the task is far from completed. Here not only the physician but the public health nurse and the medical social worker, among others, are in a very strategic position.

Effort in this field of sight conservation involves thorough understanding of the patient and of the whole family. There are factors in the emotional adjustment of young children with visual handicaps. In studies of a large group of children supposedly well and normal, 10 per cent of those under school age were found to have serious visual handicaps. Habits and attitudes, important in relation to later life, may be formed unless those problems are recognized by observing and understanding parents. The child, of course, is not at the age and position to explain, and sometimes we find a nagging parent who does not understand these problems which have such a significant after-effect.

Much assistance may be given in dealing with these problems by the medical social worker and the public health nurse in securing early discovery and early correction. Skill in understanding the child and in interpretation is needed both with the child and with the parent. This is a co-operative enterprise. In the adjustment of these children with the temporary eye difficulties and in the emotional adjustment of the school-age children, we are concerned not only with the age when the difficulty occurs but when the treatment begins, and with the training of the child and the emotional situation in the home. This is an excellent example of factors which may lie back of the initial problem which presents itself before us in the clinic or in the office or in the home.

Sometimes the problem may cause a sense of inferiority or disgrace and aggravate the child's reactions. Here the physician, the teacher, the nurse, the medical social worker may greatly help in meeting this problem of handicapped children in their adjustment to the whole situation. A home free from friction and emotional strain, of course, is what is desired in addition to the immediate help which may be given. The teacher, who is with the school-age

child so much probably occupies a more significant position than any of these other workers in handling some of these very important problems.

In the field of sight-saving classwork, interesting demonstrations of mechanical devices were conducted during the Conference, using typewriter-dictaphone combinations for teaching purposes. One of the able participants was a boy with a marked visional handicap who, however, seemed to have security built on long-term training and experience with people in whom he had confidence. The effective use of the radio in Cleveland was also illustrated.

Personal and group responsibility and initiative are most constructive forces in any public health endeavor and it certainly is true in this specialized field of sight conservation. The governmental and the private agencies can help to make this responsibility an effective force through proper organization, proper planning and effort; both understanding and desire, of course, are necessary. Six persons and groups were suggested as being in key positions in regard to this question of responsibility. Three of these key positions relate to individuals and three to agencies. First, the practicing physician. In the search for and treatment of syphilis, particularly with emphasis on the expectant mothers; in the prophylaxis of the newborn, in the knowledge which is sufficient not only to recognize a situation but to recognize one's limitations in case it is necessary to refer a patient to a specialist for further study and care, the physician holds an important place. The speaker said that a proper performance would prevent 60 per cent of the blindness. In the second place is the individual citizen in the community—a person who is interested and willing to participate; and in the third place is the citizen as a parent.

There are many public and private agencies involved. We must utilize our resources to the best advantage. Unless these forces work together closely, rather than in water-tight compartments, or alone in separate channels, we are not going to keep in mind our chief aim, the fact that we are working with a child and with a family.

The state medical societies have taken a hand in supporting sight conservation. The Indiana State Medical Society is one illustration described at the Conference. It believes in the national pro-

gram of the American Medical Association, which was adopted in San Francisco. We are familiar with the excellent radio programs and the material which can be obtained from that source and used by local and state medical societies, over and above the information contained in such publications as *Hygeia* and a good many pamphlets and reprints. The Indiana State Medical *Journal* is used as a central forum, and speakers are furnished to help in both the lay and the professional programs. The state supervising ophthalmologists are among other professional groups becoming increasingly active.

With this co-operation of the medical, the public health, the educational, and the welfare groups, there is increased recognition of so much that can be done. Increased training of the professional worker is being emphasized. A good deal of time in this Conference, for example, was given to the training of the public health nurse. In developing standard qualifications of personnel, the public health nurses have been leaders. The nurses point out that there is not so much training in some of the schools of nursing as might be desirable in regard to the need for correlation of eye health with other phases of their program, and considering not only what to teach the students but how that instruction is actually applied by the individual concerned. The value of the generalized public health nursing program with specialized consultants was also stressed.

The health department should play an essential rôle in this program. As we consider the different activities carried on by the modern health departments with their staffs of physicians and public health nurses, and sometimes with medical social workers, we note the laws which require the use of drops in the newborn babies' eyes, and which provide for premarital and prenatal blood examinations. Some of the physicians who spoke on this program were rather critical of the enforcement of some of those laws, and indicated that there is something to be done in some states in addition to the adoption of new legislation.

In New York City, if a case is found, the health department takes the laboratory specimens of the discharge, and provides for isolation, for twenty-four hour nursing service, and for medical supervision of the patient. We need to be sure that our community

through the health department or hospital service has the kind of facilities which provide prenatal care and prenatal clinics, school health programs with effective examination, and follow-up service. In regard to trachoma, the eye clinics in New York City are not so busy as they were back in 1909. But there is still need in the venereal disease clinic for the physician who has special knowledge of eye conditions. There is still need for the kind of examination which will detect these conditions. With all of these provisions as keys which will help to unlock a good many of the doors to these problems, a well-organized health education program which is comprehensive in scope is needed to disseminate information. There is a great deal of source material which can be obtained without great expense, in addition to the consulting service which is available. In all of these activities, there must be teamwork of the kind which is so well illustrated in the program of the National Society for the Prevention of Blindness.

A Survey of Illumination in Selected College Buildings

Louis M. Hickernell, M.D.

DISCUSSES lighting conditions in study rooms, libraries, laboratories and classrooms of a number of colleges, and presents practical recommendations for lighting standards.

THE relationship between adequate illumination and eye comfort has been given much consideration during recent years. Illumination in the home, in industry and elsewhere has received its share of attention. College students comprise a special group for whom it is felt that adequate illumination has a special significance by reason of the constant use of the eyes in reading and study. In 1936 the National Society for the Prevention of Blindness suggested to the New York State Branch of the American Student Health Association that a survey of lighting facilities in typical institutions represented in that group might contribute valuable data as to existing lighting conditions. The author was named as chairman of such a survey committee. This report is a summary of some of the findings.

Four universities contribute to the data submitted in this survey. They are Colgate, Cornell, Rochester and Syracuse. A total of 89 representative rooms is discussed, each of which was measured according to standard instructions provided to these institutions when they expressed their willingness to co-operate in the survey.

The data gathered for the survey were tabulated upon special survey sheets which are a modification of the one used by the Illuminating Engineering Society committee in its original survey conducted by members located at colleges throughout the United States.

One standard form was designed for each of the four types of rooms examined: the library, the laboratory, the classroom, and

the study room. Uniform data sheets were used in the various colleges to insure comparable results.

The data indicated for the survey of a classroom were recorded under the following headings, each of which was further subdivided: plan of room, color, and reflection factor of walls and ceiling in per cent; blackboards; windows; shades; lighting units; sources of glare; horizontal illumination; and range of foot-candles on work. The data noted for the study room evaluation were similar. One extra heading for a laboratory room listed questions as to work placed with a minimum of ten foot-candles for microscope use, dissection, chemical tests, and physics experiments. Special features in the library survey blank concerned the fixtures for general lighting and table lamps.

Numerous factors enter into the consideration of whether or not a room is adequately lighted. No single feature, but rather the combination of the entire equipment and plan of a room including size, arrangement, exposure, wall color, lighting fixtures, and purpose for which the room is used—all figure in the judgment of the adequacy of the light within a given room. In surveying dormitory rooms where studying is done, for example, 68 different features of each room were examined in an attempt to make an accurate evaluation of its status.

Lighting of Dormitory Study Rooms

As we summarize the results of the investigations of the 40 study rooms which have been here reported, these conclusions appear most significant:

1. All but one room had 50 foot-candles of light at the window, and out of the 36 rooms where daylight could be measured for a natural daytime condition, 26 were measured on sunny days. These measures then are presenting 72 per cent of the rooms under better-than-average daylight conditions.

2. Ceilings generally rated above 70 per cent in their ability to reflect light.

3. Only three rooms were judged below 50 per cent in wall reflection power.

4. Seventy-six per cent of the rooms had ceiling lights, all of which were direct luminaires.

5. Thirty-three rooms had a total of 66 lamps. The lamps were so distributed that 20 per cent of the total were found in rooms where there was but the one lamp; 33 per cent were in rooms where two lamps could be found; 33 per cent were in rooms where there were three lamps and the remaining two rooms each had five lamps in the room, ten lamps which constituted approximately 16 per cent of the total lamps found.

6. Seventy-one per cent of the lamps were three and one-half feet from the floor.

7. Forty-two per cent of the lamps contained 40-watt bulbs, and 27 per cent had 60-watt bulbs.

8. Only seven lamps out of the total 66 were indirect.

9. In regard to artificial lighting in dormitory study rooms it was found that 85 per cent had a minimum of five foot-candles or less of lighting on their work surfaces. Twelve per cent had as their maximum lighting ten foot-candles or less.

10. When the minimum desk places showing five foot-candles or under were totalled for the daylight readings, 53 per cent were found to be below this measure. When the measures among the maximum daylight readings under ten foot-candles were computed, it was found that 20 per cent of these readings came under the ten foot-candle measure.

11. Eighty-four per cent of the study rooms had one-half of the room area getting ten foot-candles of daylight illumination.

Interpretation of Results.—The illuminations found in the study rooms, even when measured on sunny days and near the noon hour, indicate that dormitory lighting conditions are generally inadequate. In the daylight readings half of the minimum measures proved to be amounts of light unsuited to desk work. One-fifth of the maximum daylight illuminations came under the headings of ten or fewer foot-candles. Some observations made during the survey indicate reasons for ineffective lighting conditions and suggest possible changes.

Room arrangements are subject to the students' own whims. Often the situation was found in which the desk had been placed at the window, but frequently it ran parallel to the window and not at right angles, which is preferable. When the desk can be arranged so that the light will fall across it from the left, for the

Figure 1.—Study room lighting for one person. Student is right-handed, so lamp is placed at left and just behind her shoulder line.

Figure 2.—Study room lighting for two persons, where lack of space necessitates staggered use of desk. Each student receives adequate light; light source is so located that each is protected from glare; and a large surface of ceiling is well lighted, thus providing good diffusion and good general illumination.

right-handed person, no shadow will fall on the paper during writing at the desk. Also he will not face directly the glass windowpane. In some instances students had arranged their furniture with no apparent concern for the light source in the room, the desks being in corners opposite the windows. Here often students were found working in their own shadows. This inefficient use of natural light can usually be counteracted by instructions to the student on how to arrange furniture so that the best advantage of the illumination from the window will be received.

A further simple suggestion to students is that they learn to give attention to the window shades in their rooms. The greater part of the light admitted to a room comes from the upper pane. In fact, doubling the height of the window multiplies by three the intensity of light at the far side of the room. Most frequently in students' rooms the shade was drawn to cover the upper pane completely. The custom which has fostered this habit should give way to the more efficient practice of pulling the shade only a short distance, if any, from the top of the window. It is better still to have two shades, both attached at the middle of the window, one rolling upward, the other down. A translucent shade that is light in color is to be preferred to a dark one, so that at times when sunlight is streaming into the room the shade can be drawn, not to exclude the light but to diffuse it through the room area with absence of glare.

Arrangements should be made by the student so that heavy, light-excluding drapes can be easily pinned or tied back from the pane. Also the condition of the windowpane itself needs periodic attention. An accumulation of dust and dirt on a windowpane serves to filter out light noticeably. Here, as with shades, maintenance officials may directly aid in increasing the amount of light present in study rooms.

The artificial lighting also was found in many cases to be inadequate in its minimum figures, and on this account to be serving the student badly. When 85 per cent of the minimum figures on desk surfaces are under five foot-candles and 12 per cent of the maximum under ten foot-candles, there is bound to be a resultant eyestrain to the users of the desks in connection with prolonged study. To the type of desk lamp, and the size of the bulb used in it, can be

attributed the extreme "spottiness" of the illumination on many desk surfaces. Only seven of the lamps seen were of the indirect type which insures diffusion of light and a more even distribution of it. While a 100- or 150-watt bulb is necessary in these lamps, the lessening of eyestrain which results makes it a much more desirable type of lighting fixture than the common 40-watt direct lamps.

These desk lamps which the students use are purchased by them. In several instances the low table lamps which they have provided are much more decorative than useful. In these cases especially the glare is localized in the center of the desk, and frequently it is re-directed to the students' eyes. Often the light bulb itself is visible, an undesirable feature from the standpoint of comfortable lighting. A small lamp of this sort might be permitted on a dresser where it is less constantly used, but it is not suited to a student's needs on a desk. Most students seem to have procured their lamps without any concern as to the kind of lighting that would result. Also they seem generally uninformed as to what should constitute good light. In one instance when a freshman girl was asked about the way in which she adjusted her small orchid boudoir lamp which she used for studying, she naïvely replied, "The light from it is so dim that I take the shade off completely when I read."

The plan in operation in one college is worthy of consideration. There the students are advised to plan especially for the conservation of their eyesight. For that third of the student body who live in sorority, fraternity, and rooming houses the matter is well solved by a demand on the part of the administration that the rooms be equipped with the I.E.S. indirect type of lamp. For the rest of the student body a wholesome campaign has been launched to inform students of what adequate lighting is. "The outstanding feature of the program included the co-operation of the deans and their respective student organizations at registration time at the opening of the present term, in placing in the hands of every student a copy of the pamphlet, *Your Eyes*, published by the Cleveland Sight Saving Council, together with a supplement devoted to the proper arrangement of study rooms with their desks and lighting equipment." *

* F. A. Kartak, "The Lighting of Students' Study Rooms," *The American School Board Journal*, February, 1937, p. 23.

Just as these measures have brought about improved conditions at this school, they could be similarly used in other places. Ultimately perhaps the goal would be the equipment of all rooms with I.E.S. indirect lamps. If this installation is too costly on the part of the administration or the householders, the next best step toward adequate illumination would be to arrange for definite and constructive information about the value of various lamps com-

Figure 3.—Position of lamp in a double room with desks arranged for two right-handed students. As in Figure 2, the students are receiving adequate, well-diffused illumination, and are protected from direct glare by the arrangement of desk and lamp which keeps the light source behind the left shoulder of each.

monly used by students. Those now enrolled show a general lack of understanding as to how their lighting problems can be solved, and could be helped toward a more efficient utilization of existing facilities. Entering students should certainly be told in advance of their arrival that they must furnish study lamps and that the care with which they select their lamps is well worth the time and effort so spent. Although the I.E.S. lamps may have a higher initial cost than the others, the students should be convinced that if they are bought early in the college course and used during the following

years, the annual cost is not prohibitive and the investment repays itself many times in increased eye comfort.

To the university authorities falls the responsibility for making the necessary arrangements for the increased wattage which will be consumed. In old buildings where the wiring was provided to fit former and lower standards of illumination, re-wiring may be necessary. The administration cannot be spared this obligation when it is important to the welfare of its students.

It is highly recommended then that an informative campaign be launched to help improve existing conditions, and that information as to the importance of lighting equipment be put into the hands of entering students.

Practical suggestions, simple in their arrangement and sound in principle, may be distributed in the form of a pamphlet called "Lighting of Study Rooms." Some descriptions of glare, shadows, contrast, and other objectionable features are given, and constructive principles explained. Removal of the source of the artificial light from the field of vision is stressed, and the use of the drop light and gooseneck lamp is discouraged. Instead a diffusion reflector type of lamp is advised. Room arrangements which illustrate the best use of light sources are suggested in contrast to those making poor use of them.

It is of interest at this time to quote the qualifications enumerated for the proper sort of student lamp: (1) Height of bulb from floor, 60 inches; (2) light bulb, 150 watts; (3) glare-reducing bowl, diameter 10 inches; (4) shade, top diameter 10 inches and bottom 24–26 inches, with a depth of 14 inches; (5) base, weighted to prevent tipping; (6) a standard that is firm and strong and which maintains a vertical position.

Lighting of Libraries

Twelve library rooms, five of which were in Syracuse University, were examined. The measure of the range of light upon the library tables during the evening study hours disclosed that 92 per cent of the library study rooms had five or fewer foot-candles at some of the seats. While these were the minimum figures found, the high percentage points out a general unfavorable condition. The range of the maximum readings is from two to 40. These readings on the

light meter showed over half of the maximum lighting to be under eight foot-candles. Only five of the 12 rooms had more than the desired ten foot-candle standard in their best locations.

In other types of rooms where a varied sort of activity is carried on, such low figures might be partially excused. In these library rooms, however, only close work is done. With such low illumination provided, eyestrain is bound to result. The fixtures here are permanent and allow for no accommodation to the individual student. Also it is obvious that during the evening no light from any natural source can be obtained to augment the artificial supply.

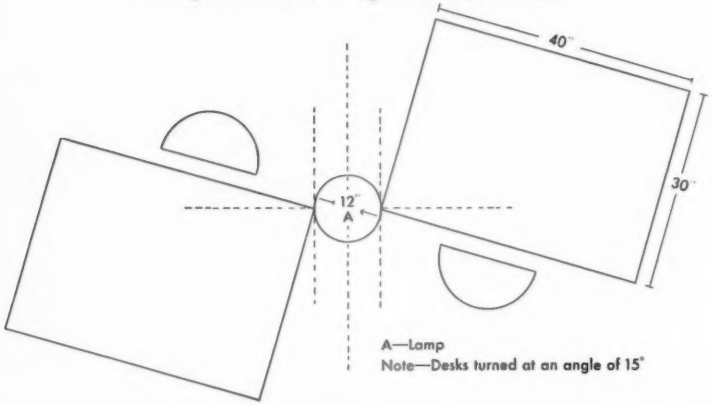
The daylight illumination figures have the advantage that there is always the possibility of adding the supply of artificial light to them. Measures of daylight intensities show that in three of the 12 rooms no part of the area received the desired minimum of ten foot-candles. Five of the 12 rooms had between 20 and 50 per cent of their areas meeting the ten foot-candle minimum. The remaining four rooms had above 55 per cent of their areas lighted to ten foot-candles, one of these being a large reading room with a skylight. When this room was measured at noon on a favorable day, it showed all of its area to have at least ten foot-candles of light.

In addition to the table illumination, that on files and stacks was noted for the rooms where these existed. Of six files measured, none had artificial illumination above ten foot-candles, and only two had daytime light above this figure. Of the ten stacks measured, one minimum daylight figure and seven maximum figures were above ten foot-candles. Of all the other figures, only one was above five.

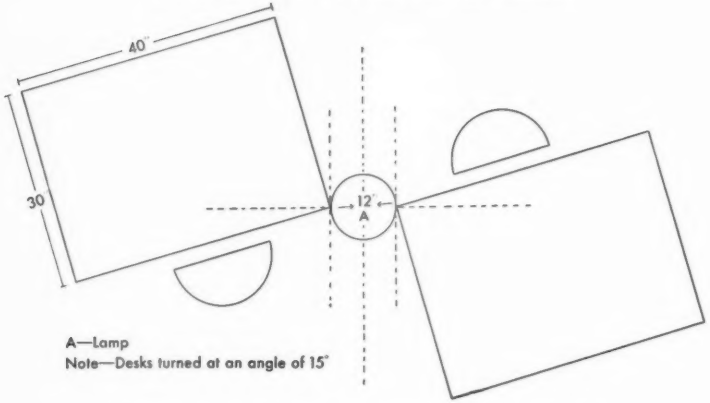
In regard to the other features which constitute good lighting, the library rooms in general had ceilings and walls which were high in their ability to reflect light; shades were usually provided; and room arrangements and lighting fixtures constituted frequent sources of glare.

Briefly then, the library lighting conditions, as shown by the examination of the 12 library rooms in three colleges, are generally inadequate. The daylight minimum on the study surfaces in half the cases is three foot-candles or less, while the minimum under artificial light shows 92 per cent of the library study rooms to be at five foot-candles and below. The maximum artificial shows only

Arrangement for Two Right-handed Students



Arrangement for Two Left-handed Students



Arrangement for Two Students—One Left-handed

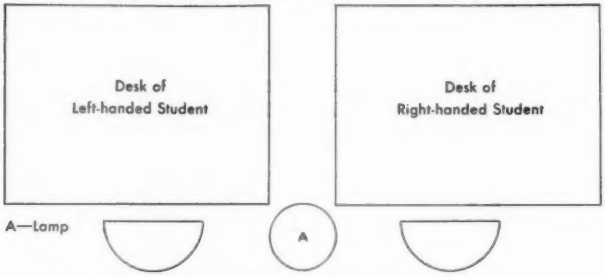


Figure 4.—Correct Desk and Lamp Arrangements

five of the 12 rooms to be above the standard in their best locations. Glare also is frequent.

The responsibility for poor facilities lies directly with the administration officials. Students who are obliged to do reading assignments in these rooms are being forced to study under conditions inviting eyestrain. It is to the administrative authorities that we must appeal for improvement of the inadequate facilities.

Lighting of Laboratories

The laboratory surveys showed that most of these rooms had less than half of their working space suitably lighted for the close work done during the daytime. The minimum daylight illuminations in the 12 rooms examined showed one-fourth of the rooms as having one foot-candle at their poorest location, one-third with two foot-candles, and one-fourth with four foot-candles. All maximum daylight figures ranged upward from 20 foot-candles, with half the rooms having their maximum falling in the 20 to 30 foot-candle range.

Minimum readings under artificial illumination are of one and two foot-candles, with the exception of one laboratory where no reading of less than three was found. Three rooms had only two foot-candles of light in their brightest spots at night. Seven of the 12 rooms had a high figure of six foot-candles at night with full artificial illumination.

When the measures of intensity upon the working places within the laboratories were considered, one-half of the rooms had between 10 and 33 per cent of their desk places lighted to the intensity of ten foot-candles. The remaining half ranged from 36 to 72 per cent of the total working places in the room with illumination of ten foot-candles. A total of 84 per cent of the laboratories had from ten to 50 per cent of their working places lighted up to the desired standard. On the basis of these figures it can be said that most of the laboratories have less than half of their working space suitably lighted for the close work done during the daytime. In only one instance is there a maximum night illumination of over ten foot-candles. Eighty-three per cent of the working areas had six or fewer foot-candles for night illumination. Nine of the days were partly cloudy and three bright, and yet the average maximum

light available was 32 foot-candles. The minimum artificial lighting figures are entirely too low, and the maximum figures are hardly better. Ceiling and wall conditions failed to serve as good light-reflecting surfaces. Shades are lacking at most windows. Variation in light intensities showed lack of diffusion, and direct lighting fixtures were uniformly found. In the laboratory situations again the administration is failing to supply adequate lighting facilities to the students it serves.

Lighting of Classrooms

In summarizing the results of the classroom surveys it is observed that a variety of sizes of rooms, kinds of days, time for study, and the like were used, so that a wide sampling of conditions under which classes are taught is represented. Shiny surfaces created glare in several instances. Window shades were usually provided, although many were of dark filled material which could not aid in providing diffusion of light. Reflection power of the walls and ceilings was generally high.

The type of ceiling unit was superior to those found in other types of rooms, 60 per cent of these rooms having indirect and semi-indirect lighting. The 50 per cent figure found for the minimum numbers of working surfaces of one and two foot-candles only was by far too high a figure, and both natural and artificial light showed this high percentage for the minimum readings. Maximum daylight readings on desks were more satisfactory, all but two being above ten foot-candles. Maximum night readings exceeded ten foot-candles in only four places, but since it is true that these rooms are used chiefly in the daytime, this inadequacy seems less important. As for the daylight which is present throughout the room, fewer than half of the classrooms had half their surfaces lighted up to ten foot-candles.

In this connection a well-planned layout for a typical classroom is cited in Figure 5. It has been approved by the American Standards Association for rooms of dimensions within the ranges indicated and having a ceiling height in the neighborhood of 12 feet.

Together with this plan the operating foot-candles that will be provided in the room are given. The figures in Table I indicate the approximate foot-candles which may be expected from each of the

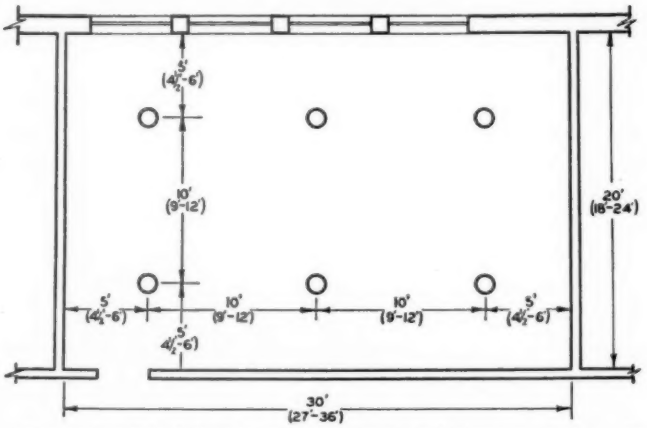


Figure 5.—A lighting layout for a typical classroom, with a ceiling height of about 12 feet, and with dimensions in the range indicated.*

TABLE I *

Type of Lighting	*Size of Lamps (Watts)*	*Room Dimensions*		
		18' x 27'	*20' x 30'*	*24' x 36'*
Indirect	300	12	9	7
	500	21	16	13
	750	31	25	19
	1,000	44	35	27
Semi-indirect	300	13	10	8
	500	23	18	15
	750	34	28	22
	1,000	49	39	32
General diffuse (enclosing globes)	200	11	9	7
	300	18	14	11

* Reprinted, with permission, from *American Recommended Practice of School Lighting*, Illuminating Engineering Society and American Institute of Architects, 1938, p. 30.

three types of lighting systems noted when lamps of the wattage shown are used at each of the outlets in a lighting arrangement corresponding to the layout in Figure 5.

Table I also serves to point out the effect of room dimensions on

resultant illumination. Naturally, if a given quantity of light must be spread out over a larger area, a lower illumination will result than if the same light is utilized in a smaller area. The three combinations of room dimensions shown are not intended to be typical of all kinds of schoolrooms but they represent the maximum, average and minimum areas in which the lighting layout in Figure 2 applies. The relative efficiency of the three lighting systems is also shown. Though less illumination is provided by the indirect and semi-indirect, the quality of light obtained compensates.

Conclusions

Of the total of 89 rooms reported in this study, each is different from the other in many details. No single plan or ideal was suggested as the arrangement which must exist in a room to provide that room with adequate lighting. Instead, in each case the structure and plan of the room itself must first be considered, and then to this setting must be added an evaluation of the light there present as it is judged according to intensity, diffusion, glare, wall color and reflection power, lighting fixtures, shades, and the like.

One standard only was accepted and uniformly applied to all rooms, that of the ten foot-candle intensity, which was here accepted as the desired intensity for college students' use.* Through the use of the foot-candle meter which can be placed upon the working surface and record the intensity reaching that place, it is possible to obtain an objective measure. No attempt is made to say how much or what kind of damage is done by inadequate lighting, but we are attempting to say that inadequate lighting might produce a definite threat to eye health.

Classrooms.—When the classrooms were considered in terms of the ten foot-candle standard, it was found that 40, 23, 58, and 37 per cents were the average per cents of the room areas so lighted by day in the four institutions. By actual count, fewer than half of the classrooms had half their working surfaces lighted up to ten foot-candles. Three of the colleges had no artificial illumination

* Since this study was made, the ten foot-candle standard of lighting has been changed by the Illuminating Engineering Society to fifteen foot-candles. See "American Recommended Practice of School Lighting," prepared under the joint sponsorship of the Illuminating Engineering Society and the American Institute of Architects, and approved by the American Standards Association.

which approached the standard throughout a room's area. In one college only was the night light adequate, and this in but 11 per cent of the total area.

Study Rooms.—For study rooms the average per cent of the room area which was lighted by day to ten foot-candles was 80 in one college and 30 in another. The combined natural plus artificial illumination measured in one college showed 26 per cent of the room areas lighted to this intensity in the combined light. Expressed in another way, 84 per cent of the study rooms had one-half of their area getting ten foot-candles of light.

Artificial illumination of ten foot-candles was present in 40 and 15 per cents respectively of the study room areas of two colleges.

Library Rooms.—Among the three library rooms, one from each college reporting, were rooms selected as representative and comparable. Considered in terms of per cents of the areas lighted to this standard, 66, 28, and 37 were the figures found by day. One room had 22 per cent of its surface with this intensity at night.

Dropping the average per cents and considering the range of light on all of the library tables, we find that 92 per cent of all the study rooms had five or fewer foot-candles as their lowest intensity under artificial light. The brightest intensities under night light showed only five of the 12 rooms above the desired ten foot-candle measure in their best locations. Daytime readings showed three of the 12 rooms with no part of their area having ten foot-candles. Five rooms had between 20 and 50 per cent of their areas meeting the standard.

Laboratories.—Two colleges gave laboratory figures which could be averaged for the amount of floor area lighted to the standard. They showed 47 and 33 per cents of the floor area so lighted. Only one per cent of the room area of one college had artificial light throughout measuring to ten foot-candles. This per cent is so small that its effect on the eye health of the whole group of students considered in these colleges is lost when it is compared to the almost entire lack of adequate lighting noted.

Expressed in other words, most of the laboratories had less than half of their working space suitably lighted for the close work done during the daytime. Eighty-four per cent had from ten to 50 per cent of their work places lighted to the standard.

Summary

Daylight illumination may thus be said to be inadequate in all of the types of rooms considered. Night illumination rarely reaches the standard except where the study rooms in two colleges averaged 40 and 15 per cents of the total floor areas so lighted.

Even where a fair percentage of the rooms approached the standard in intensity of illumination, the other factors of illumination such as reflection power of the walls and ceilings, lack of proper diffusion, wide range in intensity, and glare factors especially, frequently tended to detract from the adequacy of the illumination.

Several general conclusions can be drawn from this study, among which are the following:

1. Judged by the ten foot-candle standard, the illumination intensities in the buildings of the colleges studied are generally low.
2. The light intensities within the rooms are very uneven, permitting contrasts in the amounts of light.
3. Glare factors exist frequently.
4. The types of window shades found generally do not permit diffusion of natural light into the rooms.
5. The amount of light reflected from the walls could be improved by painting in approved colors which have higher color and reflection factors.
6. The best use of electric current is not being made due to the types of fixtures provided.
7. The best use of natural lighting is not being made.

The implications to be drawn from these investigations are:

1. That no one standard for the lighting of a room can be set up. Each room provides its specific illumination problems, with orientation, location, and use affecting the lighting requirements it must meet. Measurement by the use of the light meter is a practical means of getting an objective estimate of the light falling upon a given surface;
2. That it seems likely that no work is being done to any appreciable extent to acquaint the student with the fundamentals of good lighting, either natural or artificial, or to aid him in making the best possible use of available facilities;
3. That college administrators of the colleges studied who are in

charge of the buildings where students are taught and housed have not provided the facilities for adequate lighting;

4. That not only intensities of light, but the causes and prevention of glare, would be emphasized in informing students of ways of obtaining adequate lighting.

In final summation, the following description by Dr. John F. Gipner of Rochester seems especially pertinent, since it reflects ophthalmologic opinion on the subject of illumination facilities for college students:

> "This subject is most interesting to me as an ophthalmologist, for it is an exhaustive and complete analysis of the conditions of lighting under which the university student works. It has been prepared under the direction and guidance of a lay organization which has always been an ethical and true friend of American ophthalmology—namely, the National Society for the Prevention of Blindness. The result is that ophthalmologists will welcome the findings of this unprejudiced study and report, and will wholeheartedly support the New York Student Health Association in its efforts to better the lighting of students' study rooms, both at home and on the campus.
>
> "Ophthalmologists have long recognized the need for better illumination of homes, offices and schools, but being conservatives, and not publicity-minded, they have hesitated from joining in with electric power companies' publicity programs to sponsor and popularize the increased illumination. They have refused to accept the tests on patients of the Better Light—Better Sight program which seemed to indicate that much higher intensities of illumination than those at present commonly employed were necessary for good seeing. This test, as you know, runs from 20 foot-candles upward. The test is said to prove that:
>
> "1. Over a wide range of possible intensities, there is a critical small range in which acuity is at its optimum.
>
> "2. That the maximum acuity occurs at a high intensity.
>
> "3. That the range of intensities which produce an observable change is large.
>
> "Dr. E. J. Ludvigh of the Harvard Howe Laboratory for Research in Ophthalmology, in a recent paper, shows that these conclusions are in conflict with König's, which were written in 1897 and which have been consistently confirmed. König showed that:

"1. A change of intensity of over 10,000,000 to 1 results in a change in acuity of only approximately 20 to 1.

"2. That practically no increase of acuity results from raising the light intensity above 16 foot-candles.

"Ludvigh found that the Better Light—Better Sight test failed to let the eye adapt itself to light, and that the varied brightness of the field produced pupillary changes which prevented dilation of the pupil for the lower intensities of illumination. He states that the test is designed to, or happens to, provide an almost minimal gradient of retinal excitation per unit of intensity, conditions to which the eyes are never subjected in ordinary reading.

"Dr. Hickernell concludes that students' rooms should be equipped with I.E.S. lamps, and that university authorities should arrange for the necessary increased wattage. Marquette University already supplies a proper light fixture as well as the current. The University of Illinois now allows each student 100 watts of current. Measures such as these should be sought by the New York State Student Health Association in recommending adequate illumination for students' study rooms.

"In what way are eyes damaged by insufficient illumination? In an effort to see more clearly, the accommodation is strained with the result that fatigue ensues. Normal eyes and low degrees of hyperopia may become myopic from continued overwork. Some astigmatic eyes may also show a progression toward myopia, and myopic eyes become progressively worse. The strain upon the eyes can be relieved partly by glasses to correct the ametropia or error of refraction, but even with correcting lenses, the eyes are subject to future strain if the illumination remains improper.

"It would seem that this association has now adequate information to go before the boards of control of the constituent universities and demand programs for effective lighting on the campus and in the students' study rooms. Such action will afford effective prophylaxis to much of the present eyestrain and progressive degeneration of students' eyes while residents in the university. The knowledge of adequate lighting acquired by the student will be disseminated throughout the various communities and help the National Society for the Prevention of Blindness in its noble effort to save eyesight for more and more people."

Recommendations

Recommendations which follow from the results of the survey are:

1. Since the library rooms are in almost constant use during both day and night, they should be adequately lighted.

2. While no measure has been made of the existing power lines, it is generally admitted that the additional current necessary may not be carried by these lines. The obsolete buildings will have to be revamped if they are to meet the current standards of proper lighting. The libraries are recommended to be first to receive these changes.

Suggestions for those interested in the welfare and improvement of eye health among students for further investigations might be:

1. Studies to consider foot-candle standards to determine which meets the demands of students most hygienically;

2. Studies to investigate the causes of eyestrain among students;

3. Experimental studies of various sorts, an example of which might be the study of a control group working under improved conditions of lighting to watch their eyestrain as against that of a group with average unselected equipment;

4. Surveys in other universities to measure the conditions generally existing for student seeing.

Bibliography

Allphin, Willard. "Does School Lighting Influence Scholarship?" *The Magazine of Light*, January, 1937, pp. 8–11. Nela Park, Cleveland: General Electric Company, 1937.

Boynton, Ruth E. *Variation in Visual Acuity Among College Students*. New York: National Society for the Prevention of Blindness, 1936.

Cady, Francis Elmore. *Illuminating Engineering*. New York: Wiley and Sons, Inc., 1928.

Caldwell, Francis Cary. *Modern Lighting*. New York: The Macmillan Co., 1930.

Clark, Janet Howell. *Lighting in Relation to Public Health*. Baltimore: Williams and Wilkins Co., 1924.

Collins, S. D., and Britten, R. H. *Public Health Reports*, Vol. 39, No. 51, December, 1924.

Elliott, E. Leavenworth. *How We See.* Hoboken: General Electric Vapor Lamp Co., 1929.

Ferree, C. E., and Rand, G. "Examination and Care of the Eye in Relation to Lighting," *Archives of Ophthalmology*, January, 1937, pp. 78–103.

Ferree, C. E., and Rand, G. "Intensity of Illumination Influencing Radial Test for Astigmatism," *American Journal of Ophthalmology*, October, 1929, p. 809.

Ferree, C. E., and Rand, G. "Relation of Size of Pupil to Intensity of Light and Speed of Vision," *Journal of Experimental Psychology*, February, 1932, p. 37.

Ferree, C. E., and Rand, G. "Visibility of Objects as Affected by Color and Composition of Light," *Personnel Journal*, August, 1931, p. 10.

Frederick, Paul. *Visual Characteristics of Poor Readers.* New York: Teachers College, Columbia University, 1935.

General Electric Company. *Illumination Design Data.* Nela Park, Cleveland: Nela Park Engineering Department, 1936.

Gipner, John F., M.D. Discussion at Annual Meeting, New York State Student Health Association, May 24, 1937.

Hathaway, Winifred. "Room Design and Equipment Requirements for Sight-Saving Classes," *The American School and University*, 1936, pp. 2–8.

Illuminating Engineering Society and the American Institute of Architects. *Standards of School Lighting.* New York: Illuminating Engineering Society, 1932.

Illuminating Engineering Society and The American Institute of Architects. *American Recommended Practice of School Lighting.* New York: Illuminating Engineering Society, 1938.

Ives, James E., Knowles, Frederick L., and Thompson, Lewis R. *Studies in Illumination—IV. Daylight in Buildings.* Washington: Public Health Bulletin No. 218, April, 1935.

Joint Committee Report. *Conserving the Sight of School Children.* New York: National Society for the Prevention of Blindness, 1935.

Jackson, Edward. *Guarding the Sight of School Children.* New York: National Society for the Prevention of Blindness, 1936.

Jackson, Edward. "Light in the Schoolroom," *Journal of the American Medical Association*, September, 1937, p. 841.

Kraehenbuehl, John O. *An Investigation of Student Study Lighting.* Urbana: University of Illinois Bulletin No. 60, March, 1937.

Kraehenbuehl, John O. *Problems in Building Illumination.* Urbana: University of Illinois Bulletin No. 29, April, 1937.

Kraehenbuehl, John O. *Study Facilities in College Dormitories.* New York: National Society for the Prevention of Blindness, 1937.

Lebensohn, J. E. "Factors in Determination and Interpretation of Acuity," *Archives of Ophthalmology,* July, 1933, p. 107.

Logan, H. L. "Lighting the Classroom," *Architectural Record,* July, 1931, p. 54.

Luckiesh, Matthew. *Light and Work.* New York: D. Van Nostrand Co., 1924.

Luckiesh, Matthew. *Seeing and Human Welfare.* Baltimore: Williams and Wilkins Co., 1935.

Ludvigh, E. J. "The Gradient of Retinal Illumination and its Practical Significance," *American Journal of Ophthalmology,* March, 1937, pp. 260–265.

Metropolitan Life Insurance Company. "Lighting at School and at Home," *Health Bulletin for Teachers,* November, 1936, p. 9. New York: Metropolitan Life Insurance Press, 1936.

Millar, Preston S. *Light and Vision.* New York: National Society for the Prevention of Blindness, 1934.

National Education Association. *Report of Committee on School House Planning.* Washington: National Education Association, 1925.

Nowakowski, B. A. "The Measurement of Glare," *American Journal of Hygiene,* January, 1936, p. 30.

Phelan, Anette M. "Daylighting the Schoolroom," *Childhood Education,* September, 1937, pp. 17–21.

Sight Saving Council of Cleveland. *Your Eyes.* Cleveland: Sight Saving Council of Cleveland, 1935.

Stair, J. L. *The Lighting Book.* Chicago: Curtis Lighting Co., 1930.

Tinker, Miles A. *Illumination Intensities for Reading.* New York: National Society for the Prevention of Blindness, 1936.

White, Langdon R., Britten, Rollo H., Ives, James E., and Thompson, Lewis R. *Studies in Illumination—II. Relationship of Illumination to Ocular Efficiency and Fatigue Among the Letter Separators in the Chicago Post Office.* Public Health Bulletin No. 181. Washington: Government Printing Office, 1929.

Trachoma Control in the Indian Service*

J. G. Townsend, M.D.

A DRAMATIC account of the use of sulfanilamide in the control of trachoma among Indians.

THE Office of Indian Affairs, more than any other branch of the federal government, has faced the realities of trachoma. Just how long the North American Indian has been afflicted with the disease is not definitely known. It has been thought that the Conquistadores who entered New Mexico with Coronado in 1534 first introduced it. Early accounts (and mostly lay accounts) from the reports of trappers, explorers, traders, and the Jesuit Fathers, do not list the disease among those frequently alluded to in these old reports as being common, except for the occasional term of "bad eyes," "sore eyes," "scrofulous eyes," which may or may not have meant trachoma.

The first effort to attempt a trachoma census was in 1912, when the U. S. Public Health Service undertook a complete survey of the Indian population. All the states where Indians resided were visited, and a total of 39,231 Indians were examined. Of this number, 8,940, or 22.7 per cent, were found to be infected, the degree of infectivity varying from 68.7 per cent in Oklahoma to none in Florida.

Dr. Harry S. Gradle, trachoma consultant for the Indian Medical Service, has made a rough approximation of the total number of trachoma cases among the non-Indian population of the United States. Based on morbidity statistics in the Public Health Service, from the number of new cases discovered throughout the years in the trachoma clinics of southern Illinois, and from the number of blind persons in the United States, he has estimated approximately

* Presented at the Annual Conference of the National Society for the Prevention of Blindness, October 28, 1939.

33,800 cases of trachoma among non-Indians in this country. Comparing this figure with the approximate number of cases among Indians may be done by general estimates. The incidence of trachoma among Indians, by states, may be given as follows:

Oklahoma* and Kansas	Less than 2%	1,975
North Carolina	Less than 2%	67
Florida	0%	0
Minnesota and Wisconsin	4%	1,135
North and South Dakota	8%	3,139
Wyoming	18%	419
Montana	22%	3,595
Oregon and Washington	4%	739
Idaho	10%	42
California	Less than 2%	472
Nevada	8%	429
Utah and Colorado	12%	364
Arizona	18%	8,325
New Mexico	12%	4,329
Total		25,030

On the basis of these percentage rates, Gradle estimates 25,030 cases among the Indian population. This in a measure checks with the index of 17,320 Indians examined in general group surveys on 24 reservations, between the years 1927 and 1931. In these groups 1,213 positive cases were found—a general percentage of 7. The Indian population as of January 1, 1938, is reported as 342,497. Assuming that 7 per cent of this population were infected, we would have among the Indian groups about 24,000 cases. Of course this does not approach accuracy, but these general figures are mentioned to show that the trachoma problem which confronts the health division of the Indian Office is comparable to the infectivity rate of the rest of the entire population. This rate of Indian infectivity is not uniform. The highest infection group now is the Navajos, in Arizona, where approximately 30 per cent are infected, whereas among the Florida Seminoles there has never been a case reported, nor is trachoma found among the Taholah group at Neah Bay in the northwest tip of Washington State.

Quoting from a report prepared by Mountin and Townsend while on a survey in 1934:

* A trachoma survey throughout Oklahoma, in November, 1939, showed 366 cases in 3,092 Indian school children examined—an incidence of 11.8 per cent.

"Miscellaneous groups in Wisconsin, those at Cherokee, North Carolina, and at Cloquet, Minnesota, show practically no trachoma. Among the Mission Indians of Southern California, it runs about 3 or 4 per cent. In the Northwest there is little trachoma west of the Cascade Mountains, but among the Flathead, Blackfeet, and other Montana tribes, 20 per cent or more of the Indians show evidence of the disease. In the Dakotas about 5 per cent of the Sioux have trachoma. The Chippewas in Minnesota have less. In the Southwest the same differences are to be found among the several tribes. For example, at Zuni fewer than 1 per cent of the Indians have trachoma, while in the pueblos about Laguna the incidence runs from 16 to 25 per cent. About 30 per cent of the Navajos show evidences of trachoma and the same is true of the Apaches at San Carlos and Fort Apache; but, curiously enough, a survey of the Apaches at Jicarilla revealed only 1 per cent of the Indians to be afflicted with the disease.

"This peculiar incidence, especially when a high infectivity rate is noticed in one tribe contiguous to another tribe where the rate is almost nil, and yet social intercourse and free intermingling prevail, is a matter that warrants further study and research."

Late in the year 1936 an attempt was made to ascertain the exact number of blind Indians of which we had record. This was done in order to gather information as to the number of blind Indians who might be benefited by the provisions of the Social Security Act. For the purpose of definition, blindness was considered to exist when the vision in both eyes corrected was 20/200 or less. Reports were received from a total of 52 reservations having a combined population of 165,558. The total number of blind in this group was 971; 372 from trachoma alone; 45 because of trachoma and other conditions; and 554 comprised a group of other conditions and unknowns. Many in this group were totally blind in both eyes.

For many years the Service has tenaciously "stuck to its last" in efforts to alleviate this scourge. It has been a long, hard road. Special physicians, working under the general direction of the medical director in charge of trachoma activities, have been appointed for the purpose of visiting reservations and boarding schools, making diagnoses, doing what operative work is necessary, and prescribing treatment by the use of silver nitrate, copper sulphate,

zinc sulphate, chaulmoogra oil, and the various armamentaria of drugs used from time immemorial in the treatment of trachoma. Giving instructions as to future treatments, he goes on his way to visit another center, and perhaps does not get back to visit these cases for six months or more. Today we have 12 special physicians and 19 nurses so operating. Even so, by health education, and the co-operation of enough Indians to follow their treatment through, there has been a remarkable reduction in the trachoma rate. Certainly figures today nowhere approximate the high incidence reported in the 1912 survey. An example of intensive concentrated treatments is that of the Fort Apache Trachoma School. Here all the Indian children of that reservation who had trachoma were treated. The disease was practically wiped out among the children, but it took four years to do it.

In connection with the Fort Apache Trachoma School, the Service for the past four years has been conducting valuable research studies under the general supervision of Dr. Phillips Thygeson, of Columbia University. It might be well to mention briefly here some of these activities. Early in 1935, Thygeson, and Proctor of Santa Fe, gave a human volunteer trachoma by inoculating his eyelids with the filtered scrapings from Indian trachomatous eyes. In the belief that trachoma was in fact a filtrable virus, these studies were continued with baboons. These studies finally led to a report on the etiology of trachoma, submitted by Thygeson and Richards before the American Medical Association, in San Francisco, in June, 1938. It was stated: "The conclusion has been reached that trachoma is a virus disease and that its epithelial cell inclusions consist of masses of virus imbedded in a matrix consisting largely of glycogen."

There were other studies concomitant with these which time does not permit to discuss here, and in which Dr. Alson E. Braley, University of Iowa, participated. But a few might be mentioned. No evidence was found to incriminate insects as a vector of trachoma virus. No evidence was shown that trachoma virus will multiply in the interior of eyes after inoculation into the vitreous. Experiments suggested that there was no immunity of trachoma produced by inclusion blennorrhea virus. Inclusion bodies were found only in the epithelium of the eye and not in the sub-conjuncti-

val tissue. It has not been possible to date to cultivate the virus artificially in the laboratory, on living tissue.

In the meantime, Dr. Fred Loe of the Indian Service, on the Rosebud Reservation in South Dakota, interested in the belief that trachoma was produced by a virus, as shown in the early studies of Thygeson and Proctor and by Thygeson's experiments on baboons at Fort Apache, thought of the use of sulfanilamide as a possible agent in the treatment of trachoma. He first wrote me in December, 1937, stating in part, "We had a few cases of trachoma here that seemed to resist every kind of treatment. We started two of them on sulfanilamide, using as a dose one-third of a grain per pound of body weight. It was truly wonderful the way those eyes cleared up and they were cleared up in about two weeks. We treated, in all, only 20 cases, but the results have been the same in all. Of course this is too small a series to say that it will cure, but I do think it is the most wonderful treatment I have ever seen in trachoma, and as you know I have been treating trachoma for 20 years."

Proceeding cautiously (which should be the practice of all investigators), Dr. Richards, our Trachoma Medical Director, was sent to the area for the purpose of observing these phenomenal reports. He thought, as I did, after examining Loe's cases, that there was merit in more intensive studies with this treatment in certain selected areas in the Indian country and at the research laboratory at Fort Apache as well.

It was found that sulfanilamide definitely arrested trachoma in baboons in a comparatively short time. In one baboon within 15 days the disease practically disappeared. Nor, after treatment of a human case, was it possible to infect a baboon with the scrapings of these eyes after the eighth day. Inclusion bodies rapidly disappeared. Loe made a preliminary report of his field observations before the American Medical Association in San Francisco in June, 1938, which appeared in the *Journal of the American Medical Association*, October 8, 1938. His conclusions follow:

"Improvement of subjective symptoms:

(a) Cessation of lacrimation within twenty-four hours.
(b) Loss of photophobia within twenty-four hours.
(c) Improvement of vision within seventy-two hours in cases of pannus.

"Improvement of objective symptoms:

(a) Paling of the conjunctiva.

(b) Paling of the trachomatous patches and flattening of the granules and follicles. At the end of three weeks of treatment a few flat-topped granules remained, and we found that only after several months did these entirely disappear. The medication was not continued during these several months, however. The 93 patients treated in boarding schools during January and discharged as improved are examined at monthly intervals and continue to show improvement in the conjunctiva without further medication and with no exacerbations of any kind. Examination May 12 showed 12 with slight activity.

(c) In the cases in which there had been no scarring from instrumentation, the conjunctiva at the end of two months apparently resumed its normal velvety texture."

During the past year, intensive sulfanilamide studies have been carried out at 11 agencies throughout the Indian country situated in Arizona, Minnesota, Oregon, Montana, New Mexico, Wyoming and Nevada, and at the Fort Apache Trachoma School. At the 11 agencies, not counting the Fort Apache Trachoma School, 1,023 Indians started treatment and 959 completed treatment. Within three weeks, 413, or 43 per cent, were arrested and 481, or 50 per cent, were improved. On subsequent examinations, 122 were found to be arrested, which gives in this series a total arrestment at the time of the last examination of 55.7 per cent. Improvement in vision was found in 237 patients, and 65 were not improved at end of treatment. It should be understood that from the series we have studied, arrestments occur continuously for some time after all treatment is stopped. In other words, a degree of arrestment reported at the end of one examination does not necessarily mean that this will be the total number in the series studied.

Eighteen months ago on the Rosebud Reservation, 202 were treated with sulfanilamide. In this group, one-third of a grain, with equal parts of bicarbonate of soda, was given for about 18 days. After 18 months, this group has just been re-examined and 196 are reported as arrested, and the remaining six improved.

I have with me a breakdown of the work done at these 11 agen-

cies, and I shall mention just a few of them. For example, at the Carson Agency in Carson, Nevada, there were 84 Indians who started treatment and 64 finished. They were treated for 20 days from the first to the twentieth of May of this year. At the end of treatment, only 4 were reported as arrested, or 6.2 per cent. The same group was examined in September, 1939, from May to September, and 43 were arrested.

At Rocky Boy Agency, Montana, 50 started treatment; 50 finished treatment. From November 29, 1938, to March 9, 1939, trachoma in 4 of the 50 patients was arrested. On examination in June, 16 patients were found in whom the disease was arrested. So it goes.

Again, on the Winnebago Reservation, eight months ago 162 were given the same treatment and have just recently been re-examined. It was possible to find only 98 in this group, of which 87 were found to be arrested, eight improved, and three unimproved. It would seem that this drug sterilizes the eyes, that is, destroys the virus, and the subsequent healing is in accord with nature's own process.

It has been reported from the Fort Apache Trachoma School during the last year that 167 were given the sulfanilamide treatment for 21 days. Within 30 days' time 125, or 75 per cent, were definitely arrested. The remaining 42 were arrested after being given a second course of three weeks' treatment. Compare this with the old treatment method. During the four years that the Fort Apache School has been in operation, 428 Indians were treated, according to the old methods. In that time, 215 were arrested as follows: 37 during the first year; 65 during the second year; 67 during the third year; and 46 during the fourth year.

Results of treatment by local applications may be observed as reported from the United Pueblos, Consolidated Ute, and Mescalero Agencies. (See Table on page 287.)

When sulfanilamide was first used on the Rosebud Agency in August, 1937, the dosage was one-third of a grain per pound of body weight, with an equal amount of sodium bicarbonate, given for 10 days, at four-hour intervals. Then the dosage was decreased to one-quarter of a grain of sulfanilamide, with an equal amount of sodium bicarbonate given for 14 days, at four-hour intervals. No other medication was allowed during this period.

Trachoma Annual Reports—1938–1939

Usual Treatments Without Sulfanilamide

Place	*Examined*	*Trachoma*	*Suspected Trachoma*	*Folliculosis*	*Treated*	*Arrested*
United Pueblos						
Boarding School . .	995	159	39	8	206	58
Day School	1,733	149	71	29	246	7
Mission School . . .	558	19	6	6	4	5
Total	3,286	327	116	43	456	70
Consolidated Ute						
Boarding School . .	261	63	16	6	85	0
Day School	54	2	5	1	8	0
Total	315	65	21	7	93	0
Mescalero						
Boarding School . .	183	23	10	5	38	0
Grand Total . . .	3,784	415	147	55	587	70

Since then, various doses and treatment periods have been tried. At present the procedure of choice is one-third of a grain of sulfanilamide per pound of body weight, for five days; two days' rest; and repeat the same dosage for another five days, of course with equal amounts of sodium bicarbonate; then stop all treatment. When improvement does not follow, the treatment is to be repeated.

To date, no advantages in the use of prontosil over sulfanilamide have been demonstrated. Except in cases—and there have been a few—where sulfanilamide can not be tolerated, neoprontosil has been given with equally good results, one-half of a grain or more per pound of body weight being used. When neoprontosil is used, no bicarbonate of soda is necessary. In all our treatments with sulfanilamide or neoprontosil, patients are kept under close professional scrutiny. We have given it only in the hospitals or in boarding schools. But in a few instances it has been administered in day schools, with a corps of physicians and nurses on hand.

Of interest is the observation that sulfanilamide has no effect as a curative on follicular conjunctivitis.

Just what happens in a trachomatous eye under sulfanilamide treatment alone has been reported by Gradle, following definite information in 772 cases. Of the 772 cases, 40 were in the Illinois Eye and Ear Infirmary, 110 in the Trachoma Clinics of southern Illinois, and the remainder divided among the Sioux, Arapahoe, Shoshone, and Montana Indians. He says:

> "Within two days after the use of sulfanilamide is started the subjective symptoms are relieved and the disease is stopped at whatever stage it then happens to be in. The cornea is apparently affected first in that the superficial trachomatous process disappears promptly. Then the calibre of the vessels of the pannus narrows and the space between the vessels increases and becomes clearer. Any scarring that is present remains, but the infiltrates disappear rapidly. Conjunctival secretion lessens at the same time and usually disappears within a week. The conjunctiva becomes smoother, loses the angry red hue, and assumes a more normal pink color. Granules and follicles begin to decrease after about the second week, but remain, particularly in the depths of the transitional folds, for many weeks and months. The progress of the trachoma is definitely stopped within two to three weeks, and such reparative processes as are possible make their appearance. Of course, the connective tissue, the scars, and the other ravages of trachoma remain and are not affected by the drug. Exacerbations are extremely rare. I know of only four or five. However, the conjunctiva, both tarsal and bulbar, remains congested for many months. Whether or not all these eyes will eventually become pale, I am unable to say."

Because of the reported dangers of sulfanilamide, it has been given by the Indian Service only under hospital or school dormitory conditions, where medical service is constant.

In our series of 1,023 patients starting treatment, with 959 finishing in an average time of 21 days, only eight developed severe clinical reactions, manifested by severe headache, dizziness, fever and vomiting; 238 experienced slight reactions of mild headache and dizziness.

Blood counts were made of the group treated at Fort Defiance,

Arizona, this summer (112 in all) to determine if any change resulted in the cellular blood picture.

12 on sulfanilamide were given daily cell counts
12 controls were given daily cell counts
10 on sulfanilamide were given cell counts twice weekly
10 controls were given cell counts once weekly

The remainder of those treated were given blood examinations at the beginning and at the end of treatment.

A determination was made of the hemoglobin index—red blood cell count and white blood cell count—also the percentage of neutrophils, large monocytes, small lymphocytes, eosinophils and basophils.

No change worthy of note was observed in the blood picture during treatment or at the end of treatment or in the control group. In both groups—that is, those under sulfanilamide therapy and those not treated—the white cell count was reduced to some degree. There was no change in the hemoglobin index or in the percentage rate of the various blood cells.

There has been some difference in results in the use of sulfanilamide. We believe it has been on account of technique, rather than the fact that the drug has no value. It seemed necessary to keep up a certain blood concentration. If sulfanilamide is given only twice a day, it is eliminated so rapidly that the patient would not have it constantly in the body long enough to benefit thereby. Hence we give it in four doses during the twenty-four hours.

The general results during the past year are encouraging and we are stimulated to intensify still further our endeavors on more fronts in our long warfare against trachoma.

The Rôle of Health Departments in the Prevention of Blindness*

John L. Rice, M. D.

DR. RICE discusses what the various bureaus and divisions of the New York City Health Department are doing to help sight conservation.

THE work of the New York City Department of Health is usually thought of in connection with the contagious diseases, with tuberculosis, pneumonia, syphilis, typhoid fever, infant and maternal hygiene, the control of the milk supply, and the manufacture and distribution of antitoxins and vaccines. These are, to be sure, some of our major activities, but I should like to tell you of the many ways in which the Department is also taking an active part in the prevention of blindness.

Our activities in this field begin with the newborn child. A law, which the Department was mainly instrumental in formulating, requires that the doctor or midwife in attendance instill a drop of 1 per cent silver nitrate or other silver salt into the infant's eyes. The purpose of this is to prevent or ward off any gonorrheal or other infection of the eyes. Ophthalmia neonatorum, a purulent inflammation of the conjunctiva in the newborn, is characterized by marked swelling of the conjunctiva and lids, and a copious discharge of contagious pus. As you know, before this health measure was made compulsory, eye infections at birth were a frequent cause of blindness. If a purulent eye infection develops in spite of this precaution, the attending doctor or midwife must report this case to the Department of Health which thereupon sends an oculist to the home of the infant to make a smear of the discharge for exam-

* Presented at the Annual Meeting of the National Society for the Prevention of Blindness, New York City, October 26, 1939.

ination at our diagnostic laboratory. If the examination discloses a gonorrheal infection, arrangements are made for proper isolation and hospitalization. This preventive work of the Department has materially reduced the incidence of blindness, saved a good deal of anguish for the parents, and misery for the child, and has also lessened the expense and upkeep of institutions for the blind and visually handicapped. In passing, I may add that the care of the pregnant mother at our prenatal clinics also prevents the infection of the infant's eyes during childbirth.

A generation ago, when the Health Department first undertook the supervision of the health of school children, trachoma was one of our serious public health problems, and was the cause of much blindness in adults and children. This disease is now practically eradicated, due in large measure to the work of the Department of Health in clearing up the underlying conditions, such as insanitary, unhygienic housing, dirt and filth that helped the spread of this scourge. I can cite a few figures: About 30 years ago, the Department of Health opened a number of eye clinics for the purpose of treating trachoma and trachoma suspects among the school children. In 1909, nearly 45,000 cases of trachoma and trachoma suspects among the school population of the City of New York were treated by various clinics and private physicians, a large proportion in the eye clinics of the Health Department. Today, because of this preventive work, there are practically no cases of trachoma among school children. Of course, this work has also been aided by the facts that there is very little immigration, a more thorough eye examination is made by the doctors of the immigration service, and people have been made more eye conscious through health education.

Smallpox is another disease which formerly accounted for a goodly number of blind people whenever this disease was epidemic, by the formation of pox on the corneae and the destruction of the eyes. The compulsory vaccination of school children is so thoroughly carried out that smallpox as a cause of blindness has been entirely eliminated.

Keratomalacia, the first symptom of which is night blindness, is a destructive condition of the eyes which results in dry, dense corneal opacities and blindness, caused by a deficiency of vitamin A

mainly, and also of B, C, and D. It was formerly encountered as an accompanying condition of marasmus and malnutrition in infants. Education of the mothers in infant care and feeding, at our baby health stations, has undoubtedly been instrumental in our rarely seeing any cases of keratomalacia in our city.

Congenital syphilis, which frequently manifests itself as an interstitial keratitis in the child, is often a cause of blindness. The prevention of this inflammatory condition consists in the detection of syphilis in the parent prior to conception, or during pregnancy, and treatment of the disease if discovered. Here the Wassermann test is of great value. A good deal can be done for the child that has developed an interstitial keratitis, if Wassermann positive, by giving the proper anti-luetic treatment, so that the eye condition clears up with good vision, and the treatment is carried on until a cure is effected. The Department of Health at its many social hygiene stations does the necessary blood test, and anti-luetic treatment is given free to adults, and to children whose parents are unable to pay a private physician for this necessary prolonged treatment. At regular intervals during the anti-luetic treatment an oculist attached to the service examines the fundus of the eyes of each patient, to note the effect of the arsenic or other medication used by injection in treatment, for it must be borne in mind that the optic nerve can be affected by some of the anti-luetic drugs used, and that these could cause blindness.

Acquired syphilis often produces a primary optic atrophy in both eyes, central choroiditis, chorioretinitis, etc., and complete loss of vision. The Department of Health, as above explained, is instrumental in preventing the development of these complications by anti-luetic treatment in its various social hygiene stations.

The bureau of health education, through the distribution of posters and pamphlets, by public lectures and radio broadcasts, warns parents and children about eye care, and the necessity of immediate and skillful care and attention by an oculist of any eye injury no matter how trivial it may appear. Minor eye injuries often result in serious impairment of vision because of neglect or indifference. The outlawing of the possession and use of BB air guns and firecrackers in this city is a wise precaution.

Conservation of eyesight prevents blindness and here again the

Department of Health plays a rôle through its medical examination of school children. At regular intervals during their school life, the medical inspector examines the pupils for physical defects. Their nutrition status is noted, vision is tested by the Snellen chart, and if vision is found defective, the parent is informed, and instructed to obtain treatment and glasses. Every effort is made by the medical inspector and school nurse, aided by the principal and teacher, to get refraction defects corrected. Our experience shows that nearly 25 per cent of the city's school children have a visual defect of 20/33 or worse, and most of these children can be greatly aided by the prescription of proper glasses.

Another important and most valuable activity of the Department of Health is the division of eye clinics. There are 12 eye clinics distributed throughout the five boroughs of the city, each with a well-trained oculist in charge. Only refraction and prescribing of glasses is done at these clinics. If the child's eyes indicate the need of any medical or surgical care, such as the removal of cataracts or brain tumor, treatment of malnutrition affecting the eyes, medical study of any kind, or treatment of congenital lues, the oculist refers the child to the proper institution, clinic or hospital. Only children attending the elementary public and parochial schools, whose parents are on relief or of low economic status are examined at these eye clinics. About 70,000 visits are made to our clinics per year, and about 25,000 prescriptions for glasses are given.

Our eye clinics co-operate with the sight conservation and blind classes of the city school system, in examining the pupils of these classes, and candidates for admission to the classes. The pupils are examined at our clinics every six months to note and watch their progress. A child is recommended for a blind or "braille" class if he cannot do the work of the sight conservation class, or, if any kind of eye work is detrimental to the remaining small amount of sight. When the pupil is about to graduate, both teacher and clinic oculist advise him as to the best future vocation to pursue.

So you see how invaluable is the work of the Department of Health in the prevention of blindness. Its various bureaus and divisions, such as the eye clinics, school health service, social hygiene clinics, prenatal and child health stations, and even its food

and drug division (by preventing the sale, except on doctor's prescription, of weight reducing dinitrophenol, a drug which has often caused the rapid formation of cataracts in young people), all play a rôle in the prevention of blindness.

I believe that the Health Department's activities which I have described have undoubtedly saved many people from blindness, and prepared them for a happier, fuller, and more useful life for themselves and for society.

The Readability of Stencil-Duplicated Materials

Matthew Luckiesh and Frank K. Moss

EMPHASIZES the need for securing the best stencil-duplicating process in order to insure the highest amount of visibility.

PRINTED matter is commonly read with little consideration of the various factors which affect its visibility and readability. Among the important controllable factors, such as size and design of type, reflecting characteristics of paper and ink, level of illumination, distribution of brightness in the visual field, the quality of printing or of reproduction is a prominent one which often can be improved. Any of these factors which decrease visibility unnecessarily should be considered as a contributory cause of undesirable physiological effects of seeing.

Undue strain and fatigue of the eyes have long been known to be directly injurious to the eyes. In many cases the effects extend beyond the eyes, into the realm of health of the human being. Recent researches[1] have revealed other deep-seated effects of reading, such as tenseness. This decreases as the visibility of the reading matter increases. The rate of blinking changes similarly. These effects are at least symptomatic of strain and fatigue. Obviously, reading may be properly considered a severe task of near vision. Reading for long periods is, in a sense, an unnatural task of seeing imposed by civilization. In the light of increasing knowledge and increasing critical use of the eyes, every reasonable contribution should be made toward easing the task of seeing. In the most prevalent visual task of near vision, this means increasing the visibility and readability of the reading matter.

The present studies of the visibility and readability of stencil-duplicated materials were suggested by the observation of the wide

differences in the quality of the reproduction. Since these materials are used extensively in the schools as well as in the work world, the visual ease with which they are read is correspondingly important from the viewpoint of ocular hygiene and general well-being. We have chosen for study two stencil-duplicated materials which may be described as "average" and "superior" in quality, and have applied criteria of visibility and readability which we have used for several years with consistent results in previous studies in typography.[1] In general, the present data pertain only to the variations in the stencil-duplicated materials now available and do not involve quantitative comparisons between these materials and those duplicated by other processes or those printed from type of equivalent size.

In the discussion and interpretation of these data, we have emphasized the techniques employed in appraising the visibility and readability of the duplicated materials rather more than the empirical data obtained. Eventually it may be possible to present the results of investigations of this kind in brief tabular form when experimental procedures have been thoroughly standardized and accepted. However, in the light of present knowledge, and of our relatively new criteria, it does not appear desirable to present numerical data without an adequate discussion of the methods of appraisal.

Duplicated Materials

While it is conceded that considerable latitude is involved in the selection of the specimens described as "average" and "superior," it also follows that this ambiguity is, in itself, an indication of the marked differences in the quality of these materials. Usually these differences far exceed those found between average and superior printed matter involving the same size and face of type and the same quality of printing paper. In general, every effort was made to select the specimens of "average quality" with due consideration to both the extreme range in quality and the prevalence of the various qualities in common use. The specimens described as "superior" represent the grade of material which is obtainable with adequate skill, care and equipment. However, it may be stated that the latter is actually a commercial product rather than a theoretically ideal one.

Our specimens were reproduced on white paper with black ink. The stencils for both specimens were prepared with the same typewriter and were reproduced upon the same grade of paper in each case. The variation in the quality of the duplicated specimens resulted from the use of different duplicating materials and from different degrees of care in reproduction. In general, the materials designated as superior were quite uniform in degree of contrast or boldness, while the average specimens involved considerable variation in the boldness and visibility of individual characters or letters. Due to the uncertainties of reproducing these specimens herewith, the accompanying illustration (Fig. 1) of these materials may be somewhat distorted. However, samples of the actual specimens may be obtained from our laboratory.

AVERAGE

While here I was given an opportunity to w
struments, sounders and relays, as well as re
galvanometers like those used by telegraph en
lines. In November, I went to Menlo Park to
in the very building where the carbon transmi
perfected.

SUPERIOR

I mention this because it shows how intere
even at this late day, in his first love, the
the table in the corner with its instruments
other evidences of that affection about the p
it came much of his inspiration, and practica
lier inventions centered about it.

Fig. 1.—Illustrating the two stencil-duplicated materials investigated. Standard typewriter type, approximately equivalent to 12-point in size.

Experimental Procedures

A distinction between *visibility* and *readability* is made since the several techniques for typographical studies do not necessarily involve or appraise the same visual factors. For example, the visibility of a given line of print, as measured with the Luckiesh-Moss Visibility Meter,[2] is not appreciably altered by the proximity of

adjacent lines of print, while it is a matter of common experience that the ease of reading (readability) is markedly influenced by the space (leading) between successive lines.[3] In general, the criterion of readability is the more comprehensive since it is a function of the factors which influence visibility as well as certain psychological factors, such as distraction and attention. However, the techniques for appraising readability are far more tedious of application than are those for measuring visibility. Although the attributes of both visibility and readability are to be considered at the present time, the results of previous researches indicate that the two criteria are at least qualitatively related and that typographical characteristics which are found to be favorable by one criterion are usually found to be favorable by the other and *vice versa*.

Visibility of Stencil-Duplicated Materials

The data in Table I show the relative visibilities of the average and superior duplicated impressions on so-called white[5] paper possessing a reflection factor of 84 per cent. These measurements of visibility were made with the Luckiesh-Moss Visibility Meter and involved the recognition of words, as a whole, rather than the recognition of each individual letter. The method of measurement, therefore, is considered to approximate the perceptual conditions involved in normal reading. The visibility meter and the associated techniques have been described briefly in previous issues of this journal[4] and in detail elsewhere.[2] It will be noted that the visibility of the average material is about 70 per cent of that of the superior material.

TABLE I

Each of these values was derived from 100 separate measurements of relative visibility. Ten different samples of each stencil-duplicated material were used in determining these values.

Superior	100.0
Average	70.6

The significance of the difference in visibility between the average and superior specimens may be better appreciated by expressing this difference in terms of size of type. For example, the difference

in visibility between the two stencil-duplicated specimens is equivalent to that between 10-point and approximately 7-point types equally well printed on the same grade of paper. In considering this comparison, it may be helpful to note that 7-point type is used for body text by most newspapers while 10-point type is commonly used for well-printed books.

The relatively low visibility of the average duplicated material may well be considered an indictment of this material with respect to the degree of visibility which is technically attainable. However, the size of the characters of these duplicated materials compensates somewhat for the inferior quality of the reproduction. The latter characteristic would be revealed more strikingly if the duplicated material involved the same number of words per unit area as does the average printed book. It is not inferred that economical considerations of type size are necessarily the same in the two cases. However, these results indicate the visual advantages to be gained through the use of types of larger sizes than those commonly used at the present time.[6]

Readability of Stencil-Duplicated Materials

It is becoming increasingly certain from numerous investigations which we have made during recent years that the relative ease with which different materials are read may be revealed by observing the rate of involuntary blinking while reading under controlled conditions. For example, the data of Fig. 2 have convincingly established the fact that the rate of blinking while reading under a wide variety of visual conditions is invariably lowered when the conditions for seeing are made more favorable. Primarily, the rate of blinking decreases when the visibility of the reading matter is increased. In addition, there is a wealth of evidence from sciences of physiology and psychology which reveals the significance of this criterion from a fundamental viewpoint of ocular strain and fatigue.[7] In brief, this criterion of ease of seeing possesses the advantages of fundamental significance, simplicity in application, objectiveness and satisfactory sensitivity. The consistently successful results obtained in applying this criterion confirm our general theory that ease of seeing is more readily and certainly revealed by involuntary reactions than it is by criteria of performance over

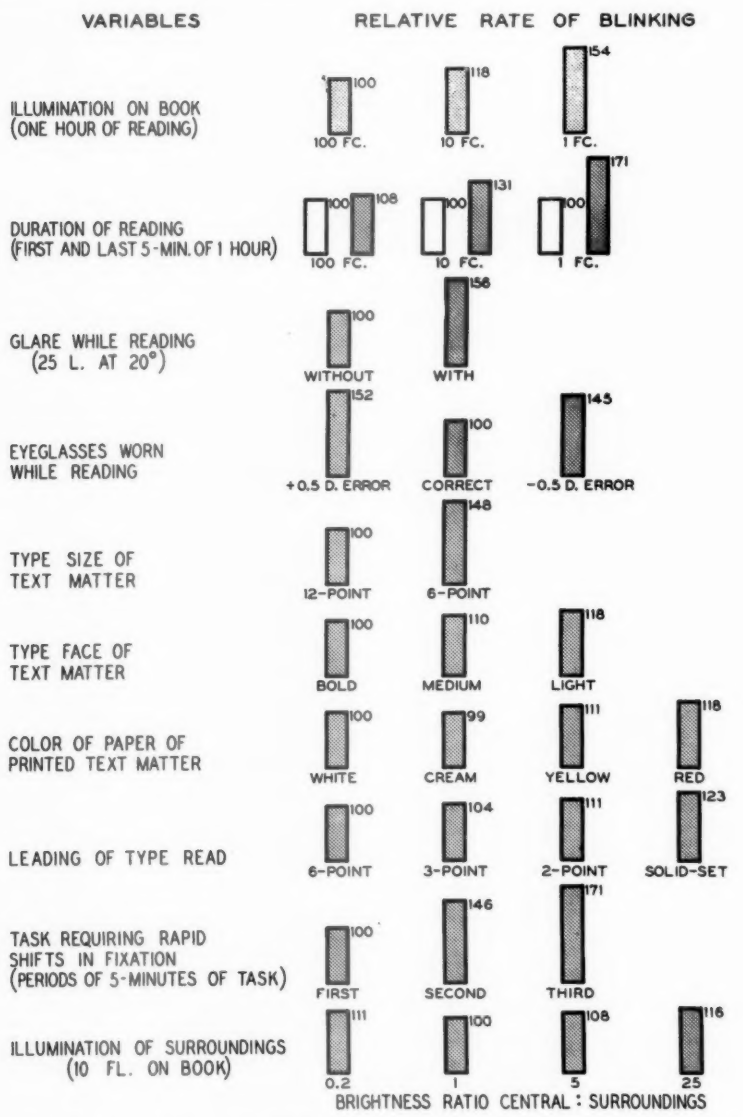


Fig. 2.—Changes in the rate of blinking while reading as various factors which influence visibility and ease of seeing are varied individually.

which the subject exercises voluntary control. Speed of reading may be cited as an example of the latter.

In applying the criterion of involuntary blinking in the present investigation, the subjects read for periods of one half-hour on each of several different days and the rate of blinking was counted during the first and last five minutes of these periods. Only one kind of duplicated material was read during each period. During the period of reading, the subject was seated before a large booth which contained a suitable rest or stand for the reading matter. The level of illumination on the reading matter was ten foot-candles and the lighting conditions were constant and without any preventable glare being present. Thus the environmental conditions, as well as the quantity of light and the quality of the lighting, remained constant throughout the entire investigation. The reading matter was of general interest and the subjects were merely instructed to read at their customary rates during the test period. Hence it is reasonable to conclude that the experimental conditions were as nearly normal as it is possible to obtain with the essential laboratory control.

The relative rates of blinking while reading the two grades of stencil-duplicated materials are summarized in Table II.

TABLE II

The number of blinks during the first and last 5-minute periods of one half-hour of reading of the stencil-duplicated materials. These values represent the geometric means of the data obtained from 12 subjects.

Material	*First 5 Min.*	*Last 5 Min.*	*Per Cent Difference*
Superior	12.2	16.1	30
Average	13.3	18.2	37
Per Cent Difference	9.0	13.0	—

These data indicate that: (1) the rate of blinking while reading the average material is measurably greater than it is while reading the superior material; (2) the rate of blinking increases markedly as the reading progresses during the 30-minute test period; and (3) the rate of blinking increased more for the average material than for the superior material during the half-hour reading periods. Thus this investigation again confirms the validity of the rate of

involuntary blinking as a criterion of ease of reading from two fundamentally significant viewpoints. Furthermore, it will be noted that the rate of blinking is inversely related to the visibility of the material read in this and many other investigations. Hence measurements of visibility may be taken as indices of readability in future studies of a similar nature. It should be obvious that the correlation between visibility and readability greatly simplifies the study of typographical problems.

It is also of interest to note that the difference in the rates of blinking while reading these two materials is approximately one-third of the increase in the rate of blinking during the half-hour test period. Thus it seems reasonable to assume that the difference in the ease with which the two materials are read is of importance when compared to the effects of effort which are indicated at the close of the 30-minute period of reading. In the absence of additional information it is obviously impossible to compare (1) the difference in the readability of these tasks with (2) the effort in reading for 30 minutes upon a quantitative basis. Eventually this may be possible.

Speed of Reading

The tacit assumption is often made that the rate of reading should increase as the visibility of the reading matter is enhanced. Unfortunately, as far as test procedures are concerned, this assumption is not a valid one in all situations or for all subjects. In some cases, for example, it appears that the subject merely expends less effort in the performance of a given task rather than to increase his "production" (rate of reading) when visual conditions are improved. Such a reaction to improved conditions is not a surprising one. Conversely, the rate of reading may be maintained notwithstanding increased difficulty due to decreased level of illumination, etc. This tendency of the reader to compensate tends to make rate of reading an undependable criterion of ease of reading. Furthermore, there is much evidence that the rate of reading is affected and actually limited by perceptual phenomena, habits and rhythms in reading more than it is by the physical characteristics of the materials now in common use. Obviously, extreme conditions due to unusual materials such as Old English type, deeply colored

printing papers or abnormally low levels of illumination are excluded from the foregoing generalization. In brief, the rate of reading may be an indication of the readability of the material, but it is not necessarily so. For example, the fact that two different materials are read at the same rate does not prove that the two materials are equivalent in readability. On the other hand, if a statistically significant difference in the rate of reading different materials is found, it may be safely assumed that the materials are different in readability.

The average rate of reading the two grades of stencil-duplicated materials is summarized in Table III. In considering these data, it is to be recalled that the subjects were instructed to read at their natural or normal rates. It may also be assumed, in view of the quantity of material read by each subject, that uncontrolled variables such as the character of the text matter and the attention of the subject to the text would be equalized for the two specimens of duplicated material.

TABLE III

The average rate of reading two stencil duplicated materials maintained during a 30-minute period. These values are arithmetic means of the individual data.

	Superior	*Average*
Lines read per minute	25.0	23.5
Relative rate of reading	100.0	94.0
Per cent probable error	2.0	2.4

It will be noted from Table III that the average material was read approximately 6 per cent more slowly than the superior material. This differential is significantly smaller than that indicated by the criterion of visibility (30 per cent) and the average rate of blinking (11 per cent). Obviously the per cent probable error from a statistical viewpoint is merely a matter of quantity of data. These results, and others of a similar character, indicate the relative insensitivity of the criterion of speed of reading. This characteristic, and the uncertainty that even qualitative differences in speed of reading will be obtained with different materials, obviously limits the usefulness of this criterion in researches which aim to ascertain

the effects of various factors in normal reading under practical conditions.

Summary

The results of the present investigation indicate that the visibility of the average quality of stencil-duplicated materials in common use is approximately 70 per cent of that which may be achieved by the best stencil-duplicating processes and experience with them. It follows from this fact that the average materials are unnecessarily difficult to read and this conclusion is substantiated by the rate of blinking while reading these materials. A similar conclusion is also indicated by the criterion of speed of reading. Of the three criteria, that of relative visibility is the only one yielding results which, at present, may be compared upon a quantitative basis with respect to visual functions and limitations. Fortunately visibility measurements are, with certain fairly obvious precautions, reliable indicators of relative readability.

Publications by the Authors

1. *The Science of Seeing*, D. Van Nostrand Co., New York, 1937. The Visibility of Various Type-Faces, *Journal of the Franklin Institute*, 1937. 223: 77.
2. Visibility—Its Measurement and Significance in Seeing, *Journal of the Franklin Institute*, 1935. 220: 431.
3. Effects of Leading on Readability, *Journal of Applied Psychology*, 1938. 22: 140.
4. The Relative Visibility of Print In Terms of Illumination Intensity, *Sight-Saving Review*, 1935. 5: 272.
5. Visibility and Readability of Print on White and Tinted Papers, *Sight-Saving Review*, 1938. 8: 123.
6. The Quantitative Relationship Between Visibility and Type-Size, *Journal of the Franklin Institute*, 1939. 227: 87.
7. Frequency of Blinking As a Criterion of Ease of Seeing, *American Journal of Ophthalmology*, 1939. 22: 616.
8. The Eyelid Reflex As a Criterion of Ocular Fatigue, *Journal of Experimental Psychology*, 1937. 20: 589.

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, and occasional pertinent quotations from other publications. We offer to publish letters or excerpts of general interest, assuming no responsibility for the opinions expressed therein. Individual questions are turned over to consultants in the particular field. Every communication must contain the writer's name and address, but these are omitted on request

Treating Trachoma by Trailer

Two years ago the West Virginia State Health Department and the Department of Public Assistance co-operated in a survey of the blind in this state that resulted in discovering more than 700 cases of trachoma. They further found that this trachoma was most widespread in the southern counties of the state, that many of the cases were of long standing, and that a large per cent of the people having trachoma were on the relief rolls. From that time on the Department of Public Assistance made plans for the establishment of a mobile treatment unit —for most of the cases were in rural sections and the contagion of the disease made it most impracticable to move the patients to the cities for treatment.

Our department was and is working on a reduced budget, new economies daily becoming necessary. Grants have long since been cut below the budgetary deficiencies. Yet both Mr. Garnett, department head, and Dr. Butterfield, in charge of the department's medical program, felt that the mobile unit was one of the necessities of our integrated program for reducing want in West Virginia. This year the trachoma unit has become an actuality, for the thirty-foot trailer, staffed with an ophthalmologist and a nurse, started on regular treatment routes June 12. There are now 323 active cases of trachoma under treatment in the 17 southern counties reached by the unit.

The trailer was especially built and contains a treatment chair, several cabinets, a refrigerator, a small cot. There is running water and at one end is a small "dark room" where the ophthalmoscope is used. It is pulled by a Dodge tractor and covers approximately 650 miles each week.

The trailer operates out of Charleston, the capital city, visiting

each of the clinic stops once a week. Besides the ophthalmologist, Dr. J. A. Arbuckle, and Miss Nash, the nurse in charge, there is a field nurse who is furnished by the State Health Department and who makes the necessary preparation for the clinics and to some extent supervises the families under treatment.

Last week I went in our trachoma trailer on its regular Monday trip to Clay and Calhoun Counties, both rural, and with relief loads of 500 and 420 respectively. Their combined population is 23,991.

It was not at all bad riding in the trailer. Miss Nash and I sat on the cot and Dr. Arbuckle sat in the treatment chair, and the jolts were negligible, especially after we reached the main highway. Our first stop was at Blue Creek, eleven miles from Charleston—a crossroads community where five patients awaited us.

They stood in front of the community store—a ramshackle building covered with advertisements of various kinds of snuff. The halt and the blind they truly were, but they seemed very glad to see us (not all of them could actually see us, but the word spread that we were there and they came quickly toward the trailer). All of them were poorly dressed, but they had obviously made some attempt at cleanliness and neatness for this weekly event. The two middle-aged women wore cheap cotton dresses too long for them, and their figures were completely shapeless. The men needed shaves and there was tobacco juice around their mouths. . . . *And their eyes!*

I had never seen trachoma before, except a very mild case once in the office of a city physician. Then it had seemed to me only an irritating inflammation of the eyelids. This, up in the hills, aggravated by dirt and malnutrition and of long duration, was different. The eyes were a dreadful red-gray, and in two cases the eyelids had grown so short that the eyeballs stood out horribly from the face. One of the men had already lost one eye.

The first patient that morning was Jim. He was about forty-five and lived on a farm three miles from the Blue Creek store. He walked a little stooped and his hair was gray, but if it had not been for the distorted eyelids and discolored eyes Jim would have been almost handsome. The week before, Dr. Arbuckle had done a Holtz operation on the left eye. That is, he had slit the eyelid, taken out a portion of the gristly substance that was forcing the lid to turn in, and had so shortened the lid that in this one eye Jim no longer felt the pain of the eyelashes rubbing the eye. This morning Dr. Arbuckle was to take out the stitches. He put a few drops of pontocaine in the eye to deaden pain.

"You're not scared, are you, Jim?" Dr. Arbuckle asked.

"No, I ain't scared. It don't do

no good to get scared, 'specially before you're hurt." The other patients waiting just inside the trailer door laughed appreciatively.

Dr. Arbuckle removed the stitches and looked at the inner eyelid. It was much better, he observed, than last week.

"Yes, it's better. Feels a lot better. Don't hurt much and I can see more. I've had this disease for 33 years and it was gettin' awful bad."

A week before Jim had been barely able to distinguish light from dark. Now, when Dr. Arbuckle put the letter chart ten feet in front of him, he could see the big E at the top of it.

Jim's wife had come in now to watch the treatment. She was, Jim boasted, his third venture in marriage. She smiled at us and nervously twisted the tarnished gold earrings she wore. Her skin looked leathery. Yet I imagine she too was in her forties. "Eight children we've had," she told me, "but they're all growed up now and gone away. One of them had bad eyes, too."

A little girl, about nine, was the next to come in for treatment. She had one bad eye, red and swollen, so that she held her head down to protect it from the light. Dr. Arbuckle dropped some neoprontosil in her eyes and gave her a bottle of pills—sulfanilamide. In this relatively new drug, Dr. Arbuckle told me, seems to lie much hope for the eventual abolition of trachoma. Although the treatments have not been continued for a sufficiently long time to insure results for all cases, there is much evidence that if the treatment is begun in the early stages the disease can be rendered inactive.

The sulfanilamide treatment (neoprontosil is a derivative of sulfanilamide) is used in two kinds of cases thus far: acute cases of long duration and new cases. For the old chronic cases there remains but the oil treatment (chaulmoogra oil), oxycyanide of mercury, and surgery. The old treatment of copper has been completely discarded as too painful and likely to cause deformities of the eyelids.

Dr. Arbuckle explained to me that trachoma is really a severe granulation of the eyelids. The inner eyelids become painfully rough and as they scrape over the cornea they produce certain blindness if the disease is unchecked. Little knots (trachoma bodies) form on the eyelid; the lid forms a gristly layer on its outer surface, which in time forces the eyelid to turn in toward the eyeball, so that in advanced stages the eyelashes comb the eyeballs at every movement. In some cases the eyelid grows fast to the eyeball. The eyeball becomes extremely red and over it is formed a fine gray curtain.

We made five more stops, seeing some 45 patients that day. At every stop there was much the same

situation: poorly dressed men and women waiting eagerly for the trailer, some of them wearing dark glasses, some of them carrying white canes given them by the Lions Clubs of the state. Most of them looked undernourished. I noticed that almost without exception they had bad teeth, even the children.

One little girl who met us at Millstone had walked seven miles that morning. She got up at 4:30 for the long walk.

"Does anyone else in your family have sore eyes?" we asked her.

"Yes, my father has them. He couldn't come today, though. He'll come next week, maybe." There were seven children in the family. We asked her how her father got trachoma and she said that he brought it back from a nearby lumber town.

Some of the men blamed their trachomatous conditions on accidents. "It started when I got dust in my eyes the fall we tore down the power house," one said. Another said that he got sand in his eyes while working on the road. The amazing thing seemed to me that they had been able to endure —and patiently—this disease so long. One of them had had it 35 years; several, over 20 years. The pain must have been indescribable.

Wyoming and Lincoln Counties, in the extreme southern part of the state, have the most trachoma. In the former there is a little girl who walks twenty miles to the trailer stop for her treatment. Another case is that of Goldie, a young woman 27 years old, whose father and mother both had trachoma and spent their entire savings on trying to rid themselves of it. For several years Goldie has had only light perception and has been doing her housework with great difficulty. Since the mobile unit came Goldie's eyes have been operated on, she has been put on the sulfanilamide treatment and can now read the second line of letters on the chart. Her eyes look much better and her general health has improved.

There are many cases not unlike Goldie's. I know that it is too early to make reliable predictions, but certainly the indications are strong that West Virginia has found a solution to her trachoma problem.

—Ann West

State Department of Public Assistance,
Charleston, West Virginia

News of State Activities

THIS Section is devoted to the reporting of sight conservation activities carried on by official and voluntary agencies throughout the country. It presents information supplied by these groups, and serves as a medium for exchange of experiences. Brief and timely items only can be used, because of the limitations of space

Arkansas

"*Trachoma Control Program.*—A review of the eye examinations of applicants for blind assistance through the State Department of Public Welfare indicates that there is a large number of cases of trachoma in the north and northwestern sections of the state.

"In order that a permanent plan might be made to combat this disease, an experimental clinic was planned to be held in Jonesboro, Craighead County, Arkansas, on August 24, 1939. At ten A.M. the clinic doors were opened, with Dr. K. W. Cosgrove, Supervising Ophthalmologist of the State Department of Public Welfare, in charge, assisted by Dr. M. E. Blanton and Dr. O. T. Cohen, approved district ophthalmologists, of Jonesboro, and Dr. W. B. Harrell, Director of the Craighead County Health Department, in whose offices the clinic was held.

"Three hundred persons registered during the day and were examined. Of the 300, 60 persons were diagnosed to have trachoma and were placed under treatment, those on tablets using from five to 20 grains of sulfanilamide per day, administered orally, and each person given a saturated solution of sulfanilamide to be dropped in the eyes four times per day. Written instructions as to the care of the eyes were given to each patient.

"On September 28, 1939, a check-up clinic was held and each of the 60 persons asked to report to the clinic. Forty-three of these persons returned, and the following results were shown:

RESULTS	*Total*	*Tablets*	*Drops*
Excellent	13	9	4
Improvement	28	17	11
No improvement	2	..	2
Cases	43	26	17

Complications to Sulfanilamide:				*Complications to Trachoma:*	
Nausea	6	Dizziness	2	Pannus	19
Rash	4	Constipation	2	Symblepharon	4
Smothering	2	Drowsiness	1	Pannus and Entropion	15
No Complications	10			Argyrosis	2
				No Complications	3

"Mr. John R. Thompson, State Welfare Commissioner, became quite enthusiastic; searched the law and found that he could carry on a program of this type for trachoma control through the Welfare Department if he could 'find the money.' In the meantime, Governor Carl E. Bailey had been studying the statistics on the causes of blindness in Arkansas and felt that some department should attempt a conservative trachoma control program, so Mr. Thompson was invited to his office for a conference. This conference between Governor Bailey and Mr. Thompson resulted in the plan for the trachoma control program which is to be under the direct supervision of Dr. K. W. Cosgrove, under the auspices of the State Department of Public Welfare. A public health nurse and a social worker have been added to the staff and plans for future clinics are being completed; the first is to be held in Mountain View, Stone County, on November 16, 1939, with a large attendance indicated from reports of the county directors from the surrounding counties."

—Department of Public Welfare, Little Rock, Arkansas

Colorado

"Colorado is again holding three eye clinics this year in rural parts of the state. These clinics are subsidized by the Division of Maternal and Child Health, and aim to reach elementary school children in chosen rural areas. Over 1,000 children were seen in the four clinics held last year, and it is hoped, through better organization, to care for the same number of children in three clinics this year. The actual diagnosis and refraction of cases is done by members of the State Ophthalmological Society, and these physicians are remunerated by the Division of Maternal and Child Health at the rate of $35.00 per day. Children are admitted to the diagnostic clinic irrespective of their economic status, while refraction and glasses are provided only for the indigent group. A printed report of last year's eye clinic program, with the foreword by Dr. Edward Jackson, will be available for distribution in the near future."

—Colorado Division of Public Health, Denver, Colorado

District of Columbia

"*New District of Columbia Law on Prevention of Blindness Effective.*—Dr. George C. Ruhland, Health Officer of the Health De-

partment of the District of Columbia, reports progress in the application of the new law for the prevention of blindness in infants born in the District of Columbia. This law was approved April 27, 1937. Since the new law was enacted he has been following up on procedures used by physicians and hospitals for the prevention of ophthalmia neonatorum. In a questionnaire sent out from the health department through the bureau of maternal and child welfare, of which Dr. Ella Oppenheimer is director, to the superintendents of the hospitals in the District of Columbia, the following points may be of interest:

"1. All hospitals used a one per cent solution of silver nitrate as a prophylaxis of ophthalmia neonatorum.
"2. There were standing orders in the hospitals for these procedures.
"3. Responsibility was centralized for the administration of the prophylaxis. In most cases the physician delivering the newborn, or supervisors in charge of the delivery room, carried this responsibility.
"4. In all but one instance a notation that the prophylaxis has been administered was recorded on the patient's record.

"Dr. Ruhland is much encouraged by the co-operation received from the physicians and hospital superintendents."

—*Bureau of Public Health Information, Department of Health, Washington, D. C.*

"Ophthalmia neonatorum has not yet become an obsolete disease. The District of Columbia Society for the Prevention of Blindness has recently made a study of cases in Washington hospitals, which reveals it to be considerably more prevalent than was generally realized. Any inflammation of the eyes appearing within 14 days after birth was considered ophthalmia neonatorum for this study. Although Washington has twice as many births among the white as among the colored population, nine-tenths of the ophthalmia neonatorum cases studied occurred among colored infants. A hospital which used argyrol prophylaxis had an incidence five times greater than that of a comparable hospital situation where silver nitrate was employed. One-fourth of the total cases were of gonorrheal origin, and about one-eighth were caused by the pneumococcus. Half of the cases gave no report of etiology. Subsequently, the health officer issued a statement to physicians and superintendents of hospitals, calling attention to the law of April, 1937, and repeating the requirement that one per cent silver nitrate be in-

stilled in the eyes of the newborn child immediately after birth unless specific authorization is obtained for use of a substitute."

—District of Columbia Society for the Prevention of Blindness, Washington, D. C.

Illinois

"*Annual Report of Trachoma Clinics, 1939.*—The Governor Horner Trachoma Clinics completed their fifth year on June 16, 1939. Trachoma, which for years has been prevalent in southern Illinois, begins for the first time this past year to show signs of diminishing. That there should be a gradual diminution in the incidence of this disease is no surprise to those who have planned and worked for this project. Originally, the Illinois Society for the Prevention of Blindness, which in 1920 and 1930 conducted surveys to demonstrate the presence of this scourge in the lower 16 counties of the state, planned to open a hospital in southern Illinois where trachoma sufferers could be treated. The plan eventually worked out by Dr. Harry S. Gradle, vice president of that organization, proved much more effective in that it made steady treatment available to many more individuals than any hospital could have accommodated. Five clinics approximately 25 miles apart offer treatment for trachoma. Each clinic is open three days a week, and on the other days the nurses make their home calls.

"At the end of the fifth year there are 3,256 positive cases of trachoma under treatment in the five clinics located at Eldorado, Shawneetown, Herrin, Jonesboro, and Vienna. This is 200 patients more than they had a year ago. Today there are 1,295 suspects under observation as compared to 1,106 last year. As long as new cases of positive trachoma continue to register at the clinics, it will be evident that the disease is not controlled. In the past year 191 operations have been performed in the clinics and the total attendance to date has been 38,217. Of course, it will be understood that many people who come to the clinics for diagnosis do not have trachoma, but suffer from other eye conditions which are a threat to their vision. These people are given a complete examination and are diagnosed. They are referred either to a local eye physician for treatment or to the Illinois Eye and Ear Infirmary for care. During the past year an effort has been made by the Illinois Society for the Prevention of Blindness to make definite provision for these cases. If they were not able to pay for medical care, they have been sent to the Infirmary for treatment or operation. Eighty-eight such cases have been sent up to the Infirmary this year. Arrangements for 24 more cases are pending until beds are available at the Infirmary. This is a pleasant by-product of the

trachoma work. During the year, those in charge have carefully noted the condition of the eyes of new positive cases reporting to the clinics for diagnosis and treatment. There were 331 such cases in the last 12 months. Of this number:

33 were in Stage I (beginning trachoma)
55 were in Stage II
66 were in Stage III
177 were in Stage IV

"Work with trachoma cannot be abated until the time comes when there are no more cases of fresh trachoma (Stage I) reporting to the clinics. It is interesting to note that of the 33 fresh cases reporting this past year:

8 were less than 10 years of age
11 were from 10 to 20 years of age
7 were from 20 to 30 years of age
2 were from 30 to 40 years of age
5 were from 40 to 50 years of age.

The preponderance of new cases will be seen to occur in the younger people. Cognizance of the fact that gradually trachoma is coming under control is shown by the fact that the budget for the clinics was cut considerably.

"Visitors from several other states have been entertained at the clinics during the year. One public health official from West Virginia visited the Illinois unit for ideas for the West Virginia trachoma control and sent his nurse to the Illinois clinics for training. The trachoma staff have held monthly meetings at which various ocular problems have been presented by experts in the field. The staff remains intact, and this continuity shows in the splendid quality of the work, in smooth efficiency, and in the confidence and satisfaction of the patients. Governor Horner, who made this work possible by the original grant in 1934, should feel deep satisfaction at the great humanitarian work that has grown out of his interest in the prevention of blindness."

—*Illinois Society for the Prevention of Blindness, Chicago, Illinois*

Indiana

"At a meeting in Indianapolis on Sunday, November 12, 1939, representatives from the Public Welfare Department, Indiana Academy of Ophthalmology, Board of Health, and the Indiana State Medical Society considered proposals for an active campaign against trachoma, which accounts for ten per cent of Indiana's

blindness. The state supervising ophthalmologist, Dr. C. W. Rutherford, gave a summary of the sulfanilamide treatment of trachoma patients who have been cared for by the Blind Assistance Division of the Public Welfare Department. A discussion of mobile units, health units, local periodic trachoma clinics, and other methods for management of this disease in southern Indiana was considered. Each community has local committees on the conservation of vision, chosen by the county medical society, and it was decided directional assistance to these committees should be given to work out a solution of the problem in each county where trachoma is prevalent."

—*Indiana State Medical Association, South Bend, Indiana*

Kansas

"The sight-saving movement is now taking root in Kansas. Wichita now has a class which is in its third year, and other cities are organizing, through co-operation with the state, similar classes. Miss Florence Folks, who finished her sight-saving course at Western Reserve University at Cleveland last summer, is now finishing her A.B. course at State Teachers College at Emporia, Kansas. Upon completion of her collegiate work, she will teach a sight-saving class at Ashland, Kansas. Miss Nellie R. Oldham, who also took the sight-saving work at Western Reserve, is to be assigned to a sight-saving class which is now in its inception at Winfield, Kansas. Pittsburg, Hutchinson and Salina are now making surveys preparatory to establishing sight-saving classes. Miss Elizabeth Snyder, school nurse at Salina, has found that at least ten pupils are in need of sight-saving class attention. However, the class has not yet opened because the state feels that a suitable room has not been selected by the Salina Board of Education. As soon as a room has been found, Salina will be the next city to have a sight-saving class.

"From all indications Kansas should have, by the end of the year, at least six or seven sight-saving classes in operation. With a population of less than two million, this should be considered a progressive step by the Sunflower State."

—*Kansas Society for the Prevention of Blindness, Wichita, Kansas*

Louisiana

"For the past quarter, we have been looking over our program of activities with a view to determining what course seems to be best suited for our future work by the experience through which we have just come, and for the purpose of seeing which activities seem best suited to different sections of our state.

"In the past, much emphasis has been given to the importance of publicity, for we believe that this is an important factor in the proper expansion of our work. Our publicity chairman has secured through the press excellent releases which have apparently attained their purpose, for there is more general recognition on the part of organizations of the importance of *sight conservation*. We have used other media of public education, and many groups have shown great enthusiasm in our program and have signified their intention of helping us. We have offered them the resources of our organization for their work in this direction. Several students of social work have come to us for literature on the subject of prevention of blindness for preparation in writing their theses. They have been given access to information and knowledge on the subject.

"We feel that the acquisition of new members during the year has been partly a result of our publicity campaign. There is no denying that we have made much progress in our program during the year, and we are grateful to our more generous citizens who made this progress possible. We believe it is imperative to continue our membership campaign and that this phase of our work should have a very definite part in our future program to further create and hold the interest of the public. An outstanding and important activity has been our campaign to alleviate an epidemic of 'sore eyes' among the school children of a rural district. This epidemic, which has occurred spasmodically for the past few months, has constituted a serious problem. On investigation we found that the attendance in one school had dropped more than 25 per cent as a result of this epidemic. We have been able to help solve this problem, for one of our chairmen, an oculist, at our request, visited the parish and took cultural tests for determining the nature of the disease. He diagnosed the condition as that of a severe type of Koch-Weeks infection and prescribed a course of treatment for each patient. A recent check-up shows that the results have been splendid. This physician will continue to visit the patients at frequent intervals until such time as the epidemic has subsided. We can point with justifiable pride to the fact that we have received such enthusiastic co-operation from our chairman. This re-awakens us to the realization that much good can be accomplished by further organizing branches throughout the state, for we believe these branches offer us exceptional possibilities for spreading our work. Some of our active chairmen are oculists and we have left the responsibility for the management of branch organizations up to them. They have adopted policies, which met with our approval, for such functioning of their branches as seemed best suited to their particular communities.

"We are ever mindful of the importance and urgent necessity

of conserving the eyesight of our school children. We have been responsible for more than 300 school children receiving eye care during the past three months, and of this number more than 100 were furnished with lenses gratis by our Society. In our work among the school children we have discovered that there is an acute need for teaching parents the common-sense fundamentals of sight conservation, and in this connection we have arranged talks before many parent groups in our state. We have reason to believe these messages are far-reaching, for inquiries pertaining to this subject come to us from many sections. We have put much stress on the fact that the entire program must be treated as educational and not as welfare work. Proper lighting in the classroom is a primary point in our campaign for better sight, and we are constantly working for correct equipment and proper arrangement.

"Many organizations in the state have done good work in helping our Society promote proper corrections of eye defects found by clinical tests. This particular type of service to our children is invaluable, especially to indigent children who are suffering from eye difficulties. We have carefully planned programs for these groups and have closely supervised their work. We arranged and supervised an eye clinic recently conducted in a rural section of our state. More than 400 school children were given preliminary eye tests and of this number more than 75 were suffering with eye difficulties. One of our co-operating agencies assumed the responsibility for a definite follow-up plan, and their duty will be to contact the parents in an effort to have necessary corrections made. In cases where children cannot afford the services of an oculist, arrangements are being made for clinical care. With a limited personnel it has not been possible for our organization to do this work unassisted. We believe the future success of this program will depend primarily on the co-operation we receive from affiliated agencies and our branch organizations. It cannot be pointed out too strongly that there is urgent need for a nurse on our staff to do follow-up work, and we are hoping in the not too distant future to add one.

"With this cursory review of the high points of our program, we believe our future course is charted along the lines mentioned above, for we know beyond fear of contradiction that we are doing much to save sight in Louisiana."

—*Louisiana Society for the Prevention of Blindness, New Orleans, Louisiana*

New Hampshire

"The Division of Maternal and Child Health of the State Board of Health has added to its free educational material two leaflets on sight conservation which are being distributed to the mothers of

the state. The leaflets are: Behaviors That May Indicate Eye Difficulties, and To the Mothers of Children with Crossed Eyes. Both leaflets are issued by the Department of Public Welfare.

"The Laboratory of Hygiene of the State Board of Health has available at all times to the physicians of the state a supply of silver nitrate."

—*State Board of Health, Concord, New Hampshire*

Pennsylvania

"The Medical Society of the State of Pennsylvania has expressed a continuance of its interest in sight saving by re-appointing the Committee on Conservation of Vision for the year 1939–1940 with the following personnel:

Samuel Horton Brown, M.D., Philadelphia, Pa.
John B. McMurray, M.D., Washington, Pa.
Lloyd C. Pierce, M.D., Harrisburg, Pa.

"The Eye Section of the Philadelphia County Medical Society has inaugurated a series of monthly postgraduate sessions covering all phases of ophthalmology for the session 1939–1940, and report the issuance of over 1,600 registration cards for the series, showing a remarkable uptake in the interest shown in topics concerning sight and the eyes."

—*The Medical Society of the State of Pennsylvania, Philadelphia, Penna.*

South Carolina

"The State of South Carolina had had no law making it mandatory to put a prophylactic in the eyes of newborn infants, thus preventing blindness from ophthalmia neonatorum which is one of the greatest causes of blindness in the state. This legislation was passed by the General Assembly in June, 1939. Our Division participated in the passage of this bill, and several months prior to the meeting of the General Assembly we secured the approval of such legislation from the State Medical Association, the State Ophthalmological Society, the State Association of Nurses, and the Lions International . . . . In recent months, our Division has also co-operated with the Division of Public Assistance in the matter of studying their medical records on approved cases. As these cases have been studied, there has been indicated on each record the treatment which had previously been recommended by the examining ophthalmologist, and these were flagged in order that the Division of Finance might be in position to interpret the medical

records to each county following such procedure as the examining ophthalmologist has recommended. We have also assisted this department in requesting reports from the counties on follow-up. In many of those cases which were serviced, while the examining ophthalmologist had recommended an operation and the supervising ophthalmologist had approved the same, there had been no plan sent in from the county for treatment. These cases have also been flagged in order that follow-up might be instituted . . . .

"The department arranged for three lectures to be held at Winthrop College during the summer session. These were conducted by an ophthalmologist. Winthrop is one of the largest colleges for women in the south and the largest one in South Carolina, and because of the fact that more teachers do their summer work there we felt it a wise selection for inaugurating this type of education. We trust to have this in other colleges very soon. About 500 students attended these lectures and their reaction to them was very encouraging.

"Since June 30, 1939, six screening clinics have been conducted. About 896 persons attended these clinics. There has also been one treatment clinic at which 27 children received treatment. A matter of interest regarding these is the fact that six of these children had seriously defective vision as result of vitamin deficiency. These were referred to their local County Department of Public Welfare with the suggestion that they co-operate with the home demonstration agent in working out correct diets. It was also suggested that they secure cod liver oil, which will be bought locally. Another effort which was made to assist these children, who all come from indigent families, was to request that they receive hot lunches at school wherever possible.

"Two field meetings were held at which talks were given to Department of Public Welfare social workers of six counties. The talks were on social implications of blindness and defective vision. At these meetings also was given the technique of taking visual acuity, and we feel that this is information that all county workers should have. As result of this, the State Department has secured Snellen charts for every County Department of Public Welfare. Similar meetings to the one just referred to will be held in all parts of the state within the coming months."

—*State Department of Public Welfare, Columbia, South Carolina*

Tennessee

"*Sight Conservation Activities.*—On August 22, the Prevention of Blindness Division was officially transferred from the Department of Institutions into the Department of Public Health, and it was

decided that in the future it would be known as the Sight Conservation Service. Since July 1, the Sight Conservation Service has had sight restored in 34 cases, of which five were of bilateral pterygia, the remaining 29 being restorations by glasses. Out of this latter group, 23 were children and six adults, and of these 18 are being prevented from going blind from amblyopia exanopsia in either one or both eyes. Two adults have been prevented by surgery from going blind, one being prevented from going blind by sympathetic disease by the enucleation of an injured eye, the other being prevented from going blind by the transplantation of a pterygium in each eye. One child has been prevented from going blind from trachoma by treatment with sulfanilamide. During this period two Lions Clubs have begun programs among the visually handicapped children in their counties—following the lead of the Lions Club of Gallatin, Tennessee, which began its work with visually handicapped children in April of this year. These Lions Clubs are those of Waverly, which is in Humphreys County, and of Centerville, which is in Hickman County. The Gallatin Lions Club, since it started its work, has brought in 22 children and furnished them with glasses, which are preventing blindness from amblyopia exanopsia in 16 of these cases. The Waverly Lions Club has brought in two children who are being prevented from going blind in one eye each, by glasses, from amblyopia exanopsia; and the Centerville Lions Club expects to bring seven children this month.

"Our first sight-saving class, which was established in the Eakins Public School of Nashville, in September, 1938, is taking care of 14 visually handicapped children this year. In September of this year another class was established at the Tennessee School for the Blind, caring for children in the first three grades, which has an enrollment of 12. The Nashville public school system is planning to establish another sight-saving class in January of 1940 to care for visually handicapped children above the sixth grade, the teacher for this class having been trained this summer at Cleveland, Ohio.

"The talking slide film on the nurse's contribution in the prevention of blindness has been shown before three groups, two being parent-teacher associations and one being a health group, reaching approximately 100 persons. The director of the Sight Conservation Service has given five talks on the causes of blindness prevalent in Tennessee and their prevention before various groups reaching approximately 150 persons. The survey of the blind of the state, which is being conducted by the Sight Conservation Service, is going forward rapidly and is now approximately 60 per cent completed. Two thousand, one hundred cases of blindness have been surveyed, and this survey so far reveals that 65 per cent of this blindness could or might have been prevented, and that 54 per cent

of this group have a chance, varying from an excellent one to an outside chance, to have their sight restored, in whole or in part, in either one or both eyes."

—*Sight Conservation Service, Department of Public Health, Nashville, Tennessee*

Washington

"To carry on the program of prevention in the field of blindness, Miss Ruth Douglass, medical social worker, has been added to the staff of the Division for the Blind. Miss Douglass joined the staff as of October 1, 1939, to pick up the activities which had been carried on by Mrs. Iva Jankelson since June, 1937. Mrs. Jankelson left the department on September 1 to attend Washington University in St. Louis for study in the field of medical social work. Miss Douglass, who has recently been doing graduate work at the University of Chicago, brings to the Division a wealth of experience in the field of prevention of blindness and conservation of vision. With departmental activities getting well under way during the new biennium which began in April, 1939, the Division for the Blind is busy reviewing its activities and making plans for the coming year. Such plans include the development of its program of vocational rehabilitation and prevention, as well as assistance to needy blind persons."

—*Division for the Blind, State Department of Social Security, Olympia, Washington*

Note and Comment

Eye Health Institute.—The National Society for the Prevention of Blindness again offers an eye health institute, February 26–March 21, under the direction of Miss Elizabeth G. Gardiner, medical social worker of its staff. Lectures will be given by Dr. Willis S. Knighton—senior assistant surgeon of the New York Eye and Ear Infirmary, and instructor of undergraduates, New York University Medical College—and members of the Society's staff. No tuition is charged, and a list of relatively inexpensive living quarters will be furnished. For application blanks and further information, address the National Society for the Prevention of Blindness, Inc., 50 West 50th Street, New York, N. Y.

National Social Hygiene Day.—During the week beginning Thursday, February 1, 1940, the country will observe its fourth National Social Hygiene Day, designed to inspire concerted action by organized groups and private individuals to ring the death knell of syphilis. The National Society for the Prevention of Blindness will take active part in this observance, maintaining an educational exhibit at the regional conference in New York City February 7. National agencies, state organizations, community clubs, and committees representing awakened members of the general public in every walk of life will review the progress made in the relentless war which recent years have brought into the open and fought with the aggressive weapons of press and radio publicity, enlightened medical advances, legislation, law enforcement, and increased public understanding. Only a few years ago prudery forbade open reference to syphilis and gonorrhea, and even today syphilis is still a major threat to the health of the nation. The fourth National Social Hygiene Day will be observed as a day on which to appraise and publicize the gains effected in the eradication of an ancient scourge, and to enlist the nation's enthusiastic and wholehearted co-operation in demolishing outworn taboos, raising present health standards, and enriching the health heritage of future generations.

Contact Lenses Make Their Début in the "Movies."—A Metro-Goldwyn-Mayer murder mystery film with comedy touches, "Miracles for Sale," starring Mr. Robert Young, has introduced the contact lens to millions of movie-goers in a highly dramatic if perhaps misleading manner. Mr. Henry Hull, as one of a group of professional magicians, among whose number several murders occur, confuses cast and theater patrons alike by appearing alternately as his characteristic self and as one of the victims, in assuming whose guise he must undergo a complete transformation. When a ruse to trap the murderer proves successful, it is shown that he "changed the color of his eyes" by the use of contact lenses which appear, when examined by the police, to be glass shells on which a blue-tinted iris surrounds a circular hole sufficiently large to permit the actor to peer, as through the slits in a mask. The technique of removal of contact lenses is demonstrated as the murderer gives up his disguise. Incidentally, no reference is made in connection with the use of the so-called "new invisible spectacles," which would indicate their proper use and function.

Courses in Ophthalmology at George Washington University School of Medicine.—An announcement received from the George Washington University School of Medicine, Washington, D. C., gives details of a week's intensive postgraduate course in ophthalmology, to be held from March 25–30 inclusive. In addition to lectures by staff specialists, the course will feature a considerable number of distinguished guest lecturers. A special five-day practical course in ocular surgery, pathology and orthoptics, to be conducted by the resident staff of the department of pathology of the University School of Medicine and the Army Medical Museum, is scheduled for the dates of March 19–23 inclusive.

The Eyes as a Gauge of General Nutrition.—In a recent issue of *The American Journal of the Medical Sciences*, Tom D. Spies, M.D., who contributes, "A Note on the Ocular Symptoms Occurring from Malnutrition in Human Beings," states: ". . . Fifty patients (suffering from pellagra, beriberi and riboflavin deficiency) . . . had or developed ocular manifestations, characterized by severe burning, itching and excessive dryness of the

eyes. Oftentimes the patients describe a 'scum' over their eyes and state that the eyes hurt when they go into sunlight. There is granulation and extreme redness of the conjunctiva, particularly of the lower lids, and a striking degree of photophobia . . . These lesions appear, irrespective of whether the deficiency developed as the result of an inadequate food intake due to economic factors or to chronic alcoholic addiction, or as the result of organic diseases which interfered with adequate nutrition. Unpublished observations on 70 unselected cases in the nutrition clinic, 20 of whom were children, showed a striking deficiency of vitamin A in the diets of 65 cases. Following the daily administration of vitamin A, in the form of carotene in oil or as oleum percomorphum, in amounts ranging from 10,000 to 50,000 units, these patients were able to read better, the burning ceased, and the conjunctivitis and photophobia disappeared. Following this therapy there has been, so far, little if any improvement in the dizziness, nystagmus, and dilated pupils, but the patients have reported an increase in strength and feeling of well-being . . ."

Sweets for the Eyes of High Flyers.—Lowered oxygen pressure has been discovered to have a marked effect upon the adaptation of the human eye to dark and light, but may be counteracted by a dose of glucose. Therefore it is not unlikely that emergency rations of sweets may presently be issued to bombing plane pilots cruising at high altitudes, as an aid to accurate reading of brilliantly illuminated instruments in planes flying over blacked-out areas.

Current Publications on Sight Conservation

Note.—The National Society for the Prevention of Blindness presents the most recent additions to its stock of publications. Except for the more expensive ones, single copies are sent free upon request. Unless otherwise specified, they are reprinted from THE SIGHT-SAVING REVIEW. New publications will be announced quarterly.

309. The Radio and the Talking Book in Sight-Saving Classes, Olive S. Peck. 12 p. 10 cts. Cleveland's experience in arranging radio and talking book instruction for elementary school sight conservation classes. Reprinted from *The Sight-Saving Class Exchange*, November, 1939.

310. Theory of Handwork in the Sight-Saving Class, Ada Burress. 8 p. 5 cts. The author presents a study of manual and artistic development in young children through selected and guided handwork projects. Reprinted from *The Sight-Saving Class Exchange*, November, 1939.

311. Work Units for Sight-Saving Classes, Io Starr. 24 p. 15 cts. Lists scores of handwork units, with recipes and full directions, to be undertaken by sight-saving class groups. Reprinted from *The Sight-Saving Class Exchange*, November, 1939. (Original title: "Problems, Recipes and Directions.")

312. Motivated Handwork and Activity Units in Sight-Saving Classes, Sarah Latimer Phelps. 16 p. 10 cts. The author suggests and describes handwork units related to other studies and to group activities in particular. A long list of helpful texts is appended. Reprinted from *The Sight-Saving Class Exchange*, November, 1939.

313. A Survey of Illumination in Selected College Buildings, Louis M. Hickernell, M.D. 20 p. 15 cts. Discusses lighting conditions in study rooms, libraries, laboratories and classrooms, and presents practical recommendations for lighting standards.

314. Trachoma Control in the Indian Service, J. G. Townsend, M.D. 12 p. 10 cts. A dramatic account of the use of sulfanilamide in the control of trachoma among the American Indians.

315. The Rôle of Health Departments in the Prevention of Blindness, John L. Rice, M.D. 8 p. 5 cts. Discusses what the various bureaus and divisions of the New York City Health Department are doing to help sight conservation.

316. Readability of Stencil-Duplicated Materials, Matthew Luckiesh and Frank K. Moss. 12 p. 10 cts. Emphasizes the need for securing the best stencil-duplicating process to insure highest visibility.

317. Treating Trachoma by Trailer, Ann West. 12 p. 5 cts. A human and informal description of a day's adventures with a mobile treatment unit operating out of Charleston, West Virginia.

318. Sight Conservation Through Fuller Understanding of the Patient, Lena R. Waters, Chairman. A symposium of Annual Conference papers: 1. The Young Child with a Visual Handicap, Helen H. Shaw; 2. The Older Child with Eye Difficulties, Bertha Ross; 3. Children with Temporary Eye Difficulties, Ruth E. Lewis. 28 p. 15 cts. Supplement to Vol. IX, No. 4, of THE SIGHT-SAVING REVIEW, December, 1939.

Contributors to This Issue

Dr. Ira V. Hiscock, a member of the Society's Board of Directors, is Professor of Public Health at the School of Medicine, Yale University.

Dr. Louis M. Hickernell is associated with the College Infirmary, Student Health Service, Syracuse University.

Under the auspices of the United States Department of the Interior, **Dr. J. G. Townsend,** Director of Health, Office of Indian Affairs, has been able to pursue his trachoma studies described in this issue.

Dr. John L. Rice is Commissioner of the New York City Department of Health, and a member of the Society's Board of Directors.

REVIEW readers are well acquainted with the work of **Messrs. Luckiesh** and **Moss.**

Mrs. Helen H. Shaw is on the staff of the Social Service Department of the Children's Hospital, Washington, D. C.

Miss Bertha Ross is on the staff of the Social Service Department of St. Luke's Hospital, New York City.

As assistant professor of medical social work at the George Warren Brown Department of Social Work of Washington University, St. Louis, **Miss Ruth E. Lewis** has taken an active part in the development of medical social eye work.

Erratum.—Mr. Harry O. Page, author of "Prevention of Blindness as Seen by an Interdepartmental Council," appearing in the September, 1939, issue of the REVIEW, and mentioned in our contributors' column on page 248, is Commissioner of Public Welfare of the State of New Hampshire.

Index—Sight-Saving Review

Volume IX: 1939

A Medical Social Case Work Approach to the Development of an Eye Health Program. MURIEL GAYFORD. 3:192

A Proposed Sight-Saving Class Program for Tennessee. ELLIOTT S. FORD. **(Forum)** 1:55

A Survey of Illumination in Selected College Buildings. LOUIS M. HICKERNELL, M.D. 4:259

Advances in Prevention of Blindness and Conservation of Vision —A Summary of Conference Features. IRA V. HISCOCK, D.Sc. 4:251

An Evaluation of Vision-Testing Methods in Schools. JOHN B. HITZ, M.D. 1:47

Annual Conference of the National Society for the Prevention of Blindness. 1:53

AVIRETT, JOHN WILLIAMS, 2D. Prevention of Blindness as Seen by a Private Agency. 3:169

BARTELS, M., PROFESSOR DR. Sight-Saving Classes (An Excerpt from the German). 1:18

BARTRAM, WILLIAM E. Prevention of Blindness as Seen by a Commission for the Blind. 3:163

BERENS, CONRAD, M.D. Modern Conception of Conservation of Vision. 2:119

Book Reviews:

Documenta Ophthalmologica: A Synthesis of Recent Advances in Ophthalmology, Volume I. Edited by A. Juhasz-Schäffer. Reviewed by Park Lewis, M.D. 1:74

Etiology of Trachoma. Louis A. Julianelle, Ph.D. Reviewed by Martin Cohen, M.D. 3:246

Eyestrain and Convergence. N.A. Stutterheim, M.D. Reviewed by Edmund B. Spaeth, M.D. 3:244

Prediction and Prevention of Reading Difficulties. Margaret A. Stanger and Ellen K. Donohue. Reviewed by Winifred Hathaway. 1:77

Principles and Practice of Ophthalmic Surgery. Edmund B. Spaeth, M.D. Reviewed by Francis Heed Adler, M.D. 3:245

Psychological Optics. Vernon W. Grant. Reviewed by Conrad Berens, M.D. 1:76

Refraction of the Eye. Alfred M. Cowan, M.D. Reviewed by Edmund B. Spaeth, M.D. 3:244

Refraction of the Human Eye and Methods of Estimating the Refraction. James Thor-

Book Reviews—*Continued*
ington, M.D. Revised and edited by J. Monroe Thorington, M.D. Reviewed by Conrad Berens, M.D. 3:245
Textbook of Eye, Ear, Nose and Throat Nursing. Abby-Helen Denison, R.N. Revised by Lyyli-Eklund, R.N. Reviewed by Cora L. Shaw, R.N. 1:74

Books Received: 1:77

BURIAN, HERMANN N., M.D. Contact Glasses. **(Forum)** 1:62

CARPENTER, EVELYN M. Story of a Fireworks Bill. **(Forum)** 2:150

CARRIS, LEWIS H. Thirty Years in Saving Sight. **(Forum)** 3:213

Children with Temporary Eye Difficulties. RUTH E. LEWIS. Supplement to 4:21

Children:
A Proposed Sight-Saving Class Program for Tennessee. ELLIOTT S. FORD. **(Forum)** 1:55
An Evaluation of Vision-Testing Methods in Schools. JOHN B. HITZ, M.D. 1:47
Children with Temporary Eye Difficulties. RUTH E. LEWIS. Supplement to 4:21
Development of the Normal Eye in Infancy and Childhood. WILLIS S. KNIGHTON, M.D. 1:3
Prevention of Blindness from Ophthalmia Neonatorum (Report of the Standing Committee on Conservation of Vision of the State and Provincial Health Authorities of North America, 1939). 2:126
Sight-Saving Classes (An Excerpt from the German). PROFESSOR DR. M. BARTELS. 1:18
Story of a Fireworks Bill. EVELYN M. CARPENTER. **(Forum)** 2:150
The Older Child with Eye Difficulties. BERTHA ROSS. Supplement to 4:12
The Psychological Touch in Straightening Cross-Eyes. META ROSENTHAL. 1:11
The Rôle of Light in Education. N. BISHOP HARMAN. 2:83
The Young Child with a Visual Handicap. HELEN H. SHAW. Supplement to 4:4

College Student and Dormitory Study Facilities, The. ANETTE M. PHELAN, Ph.D. 1:26

Colleges:
A Survey of Illumination in Selected College Buildings. LOUIS M. HICKERNELL, M.D. 4:259
The College Student and Dormitory Study Facilities. ANETTE M. PHELAN, Ph.D. 1:26

Conservation of Vision:
A Medical Social Case Work Approach to the Development of an Eye Health Program. MURIEL GAYFORD. 3:192
Fifteen Years' Progress in Eyesight Conservation in Industry. LOUIS RESNICK. 2:105
Industrial Eye Protection Program: How is it Set Up? How is it Put Across? How is it

Conservation of Vision—*Continued*
Kept Across? HARRY GUILBERT. 2:114
Modern Conception of Conservation of Vision. CONRAD BERENS, M.D. 2:119
Contact Glasses. HERMANN N. BURIAN, M.D. **(Forum)** 1:62

Contributors: 1:80; 2:160; 3:248; 4:325

Current Articles of Interest: 1:71; 3:239

Current Publications on Sight Conservation: 1:78; 2:159; 3:247; 4:324

DESSOFF, JOSEPH, M.D. Injuries to the Eyes. 1:36
Development of a Prevention of Blindness Program from the Standpoint of an Ophthalmologist. HARRY S. GRADLE, M.D. 3:204
Development of the Normal Eye in Infancy and Childhood. WILLIS S. KNIGHTON, M.D. 1:3
Evaluation of Vision-Testing Methods in Schools, An. JOHN B. HITZ, M.D. 1:47

Eye Diseases and Defects:
An Evaluation of Vision-Testing Methods in Schools. JOHN B. HITZ, M.D. 1:47
Children with Temporary Eye Difficulties. RUTH E. LEWIS. Supplement to 4:21
Contact Glasses. HERMANN N. BURIAN, M.D. **(Forum)** 1:62
Development of the Normal Eye in Infancy and Childhood. WILLIS S. KNIGHTON, M.D. 1:3
The Older Child with Eye Difficulties. BERTHA ROSS. Supplement to 4:12
The Psychological Touch in Straightening Cross - Eyes. META ROSENTHAL. 1:11
The Young Child with a Visual Handicap. HELEN H. SHAW. Supplement to 4:4
Trachoma Control in the Indian Service. J. G. TOWNSEND, M.D. 4:280
Treating Trachoma by Trailer. ANN WEST. **(Forum)** 4:305

Eye Injuries:
Industrial Eye Protection Program: How is it Set Up? How is it Put Across? How it it Kept Across? HARRY GUILBERT. 2:114
Injuries to the Eyes. JOSEPH DESSOFF, M.D. 1:36
Story of a Fireworks Bill. EVELYN M. CARPENTER. **(Forum)** 2:150
The Head and Eye Protection Code of the National Bureau of Standards. M. G. LLOYD. 2:98

Fifteen Years' Progress in Eyesight Conservation in Industry. LOUIS RESNICK. 2:105

Fireworks:
Story of a Fireworks Bill. EVELYN M. CARPENTER. **(Forum)** 2:150

FORD, ELLIOTT S. A Proposed Sight-Saving Class Program for Tennessee. **(Forum)** 1:55

Forum:

A Proposed Sight-Saving Class Program for Tennessee. ELLIOTT S. FORD. 1:55

Contact Glasses. HERMANN N. BURIAN, M.D. 1:62

Story of a Fireworks Bill. EVELYN M. CARPENTER. 2:150

Thirty Years in Saving Sight. LEWIS H. CARRIS. 3:213

Treating Trachoma by Trailer. ANN WEST. 4:305

GAYFORD, MURIEL. A Medical Social Case Work Approach to the Development of an Eye Health Program. 3:192

GRADLE, HARRY S., M.D. Development of a Prevention of Blindness Program from the Standpoint of an Ophthalmologist. 3:204

(editor) Sight-Saving Classes (An Excerpt from the German). Professor Dr. M. Bartels. 1:18

GUILBERT, HARRY. Industrial Eye Protection Program: How is it Set Up? How is it Put Across? How is it Kept Across? 2:114

HARDIN, GWEN. Prevention of Blindness as Seen by a Social Security Administrator. 3:177

HARMAN, N. BISHOP. The Rôle of Light in Education. 2:83

HICKERNELL, LOUIS M., M.D. A Survey of Illumination in Selected College Buildings. 4:259

HISCOCK, IRA V., D.Sc. Advances in Prevention of Blindness and Conservation of Vision—A Summary of Conference Features. 4:251

HITZ, JOHN B., M.D. An Evaluation of Vision-Testing Methods in Schools. 1:47

Illumination:

A Survey of Illumination in Selected College Buildings. LOUIS M. HICKERNELL, M.D. 4:259

The College Student and Dormitory Study Facilities. ANETTE M. PHELAN, Ph.D. 1:26

The Rôle of Light in Education. N. BISHOP HARMAN. 2:83

Industrial Eye Protection:

Fifteen Years' Progress in Eyesight Conservation in Industry. LOUIS RESNICK. 2:105

Industrial Eye Protection Program: How is it Set Up? How is it Put Across? How is it Kept Across? HARRY GUILBERT. 2:114

The Head and Eye Protection Code of the National Bureau of Standards. M. G. LLOYD. 2:98

Injuries to the Eyes. JOSEPH DESSOFF, M.D. 1:36

KNIGHTON, WILLIS S., M.D. Development of the Normal Eye in Infancy and Childhood. 1:3

LEWIS, RUTH E. Children with Temporary Eye Difficulties. Supplement to 4:21

LLOYD, M. G. The Head and Eye Protection Code of the National Bureau of Standards. 2:98

LUCKIESH, MATTHEW and MOSS, FRANK K. Readability of Stencil-Duplicated Materials. 4:295

Medical Social Service:

A Medical Social Case Work Approach to the Development of an Eye Health Program. MURIEL GAYFORD. 3:192

Sight Conservation Through Fuller Understanding of the Patient. LENA R. WATERS, Chairman.

Supplement to Vol. IX, No. 4:

1. The Young Child with a Visual Handicap. HELEN H. SHAW.
2. The Older Child with Eye Difficulties. BERTHA ROSS.
3. Children with Temporary Eye Difficulties. RUTH E. LEWIS.

Modern Conception of Conservation of Vision. CONRAD BERENS, M.D. 2:119

MOSS, FRANK K. and LUCKIESH, MATTHEW. Readability of Stencil-Duplicated Materials. 4:295

National Society for the Prevention of Blindness, Annual Conference of the. 1:53

News of State Activities: 1:63; 2:153; 3:217; 4:309

Note and Comment: 1:68; 3:231; 4:321

Older Child with Eye Difficulties, The. BERTHA ROSS. Supplement to 4:

PAGE, HARRY O. Prevention of Blindness as Seen by an Interdepartmental Council. 3:185

PHELAN, ANETTE M., Ph.D. The College Student and Dormitory Study Facilities. 1:26

Prevention of Blindness:

Advances in Prevention of Blindness and Conservation of Vision—A Summary of Conference Features. IRA V. HISCOCK, D.Sc. 4:251

Development of a Prevention of Blindness Program from the Standpoint of an Ophthalmologist. HARRY S. GRADLE, M.D. 3:204

Prevention of Blindness as Seen by a Commission for the Blind. WILLIAM E. BARTRAM. 3:163

Prevention of Blindness as Seen by a Private Agency. JOHN WILLIAMS AVIRETT, 2D. 3:169

Prevention of Blindness as Seen by a Social Security Administrator. GWEN HARDIN. 3:177

Prevention of Blindness as Seen by an Interdepartmental Council. HARRY O. PAGE. 3:185

Prevention of Blindness from Ophthalmia Neonatorum (Report of the Standing Committee on Conservation of Vision of the State and Provincial Health Authorities of North America, 1939). 2:126

The Rôle of Health Departments in the Prevention of Blindness. JOHN L. RICE, M.D. 4:290

Prevention of Blindness as Seen by a Commission for the Blind. WILLIAM E. BARTRAM. 3:163

Prevention of Blindness as Seen by a Private Agency. JOHN WILLIAMS AVIRETT, 2D. 3:169

Prevention of Blindness as Seen by a Social Security Administrator. GWEN HARDIN. 3:177

Prevention of Blindness as Seen by an Interdepartmental Council. HARRY O. PAGE. 3:185

Prevention of Blindness from Ophthalmia Neonatorum (Report of the Standing Committee on Conservation of Vision, State and Provincial Health Authorities of North America, 1939). 2:126

Psychological Touch in Straightening Cross-Eyes, The. META ROSENTHAL. 1:11

Readability of Stencil-Duplicated Materials. MATTHEW LUCKIESH and FRANK K. MOSS. 4:295

Report of the Standing Committee on Conservation of Vision, State and Provincial Health Authorities of North America, 1939—Prevention of Blindness from Ophthalmia Neonatorum. 2:126

RESNICK, LOUIS. Fifteen Years' Progress in Eyesight Conservation in Industry. 2:105

RICE, JOHN L., M.D. The Rôle of Health Departments in the Prevention of Blindness. 4:290

Rôle of Health Departments in the Prevention of Blindness, The. JOHN L. RICE, M.D. 4:290

Rôle of Light in Education, The. N. BISHOP HARMAN. 2:83

ROSENTHAL, META. The Psychological Touch in Straightening Cross-Eyes. 1:11

ROSS, BERTHA. The Older Child with Eye Difficulties. Supplement to 4:12

SHAW, HELEN H. The Young Child with a Visual Handicap. Supplement to 4:4

Sight Conservation Through Fuller Understanding of the Patient. LENA R. WATERS, Chairman. Supplement to 4:3

Sight-Saving Classes:

A Proposed Sight-Saving Class Program for Tennessee. ELLIOTT S. FORD. **(Forum)** 1:55

Sight-Saving Classes (An Excerpt from the German). PROFESSOR DR. M. BARTELS. 1:18

Sight-Saving Classes (An Excerpt from the German). PROFESSOR DR. M. BARTELS. 1:18

State Activities, News of: 1:63; 2:153; 3:217; 4:309

State and Provincial Health Authorities of North America. Report of the Standing Committee on Conservation of Vision, 1939—Prevention of Blindness from Ophthalmia Neonatorum. 2:126

Story of a Fireworks Bill. EVELYN M. CARPENTER. **(Forum)** 2:150

Supplement to Vol. IX, No. 4: Sight Conservation Through Fuller Understanding of the Patient. LENA R. WATERS, Chairman.

Supplement to Vol. IX, No. 4—*Continued*

1. The Young Child with a Visual Handicap. HELEN H. SHAW.
2. The Older Child with Eye Difficulties. BERTHA ROSS.
3. Children with Temporary Eye Difficulties. RUTH E. LEWIS.

Survey of Illumination in Selected College Buildings, A. LOUIS M. HICKERNELL, M.D. 4:259

The Older Child with Eye Difficulties. BERTHA ROSS. Supplement to 4:12

The Psychological Touch in Straightening Cross-Eyes. META ROSENTHAL. 1:11

The Rôle of Health Departments in the Prevention of Blindness. JOHN L. RICE, M.D. 4:290

The Rôle of Light in Education. N. BISHOP HARMAN. 2:83

The Young Child with a Visual Handicap. HELEN H. SHAW. Supplement to 4:4

Thirty Years in Saving Sight. LEWIS H. CARRIS. **(Forum)** 3:213

TOWNSEND, J. G., M.D. Trachoma Control in the Indian Service. 4:280

Trachoma Control in the Indian Service. J. G. TOWNSEND, M.D. 4:280

Treating Trachoma by Trailer. ANN WEST. **(Forum)** 4:305

WATERS, LENA R., Chairman. Sight Conservation Through Fuller Understanding of the Patient. Supplement to Vol. IX, No. 4:3

WEST, ANN. Treating Trachoma by Trailer. **(Forum)** 4:305

Young Child with a Visual Handicap, The. HELEN H. SHAW. Supplement to 4:4